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SPOLIA ZEYLANICA.

NOTES ON CEYLON BUTTERFLIES.

By W. ORMISTON, F.E.S.

(With two Plates.)

AS I have now collected butterflies in Ceylon for nearly thirty years, my notes may prove of some use to other collectors, so I have decided to publish them.

The great majority of my collecting was done at Haldummulla, in the Province of Uva. This is an exceptionally well-situated district: a circle, with its centre at Haldummulla post office and a radius of 5 miles, includes a portion of the Horton Plains (7,200 feet), Ohiya (6,000 feet), Haputale (5,000 feet), Diyatalawa (4,400 feet), and low-country with an elevation of about 600 feet only. In other words, the variation of elevation is at least 6,500 feet. Within this circle I have personally taken over 200 species out of the 244 mentioned in these notes.

Naming the species is not an easy matter. The four leading authorities on Ceylon butterflies, given in order of date of publication, are: 1st, "Lepidoptera of Ceylon," by Moore; 2nd, "The Butterflies of India, Burma, and Ceylon," by Colonel Marshall and De Niceville; 3rd, "Fauna of India: Butterflies," by Colonel Bingham; 4th, "A List of Indian Butterflies," by Captain Evans. In some instances all four authorities name the same insect differently, and still further changes in the names have appeared since Captain Evans's list was published.

Most collectors cannot afford to purchase all the books, but Moore's "Lepidoptera of Ceylon" is the standard work on Ceylon specimens only, and is kept at all the principal kacheeries, for the benefit of collectors. I have therefore, as much as possible, given his names the preference, but mention the others, giving the authority after each.

Butterflies' names may be composed of four parts: genus, sub-genus, species, and race, but it is hardly ever necessary to

use all four. For instance, *Euplœa crastia core asela* is equally well identified if labelled *Euplœa asela*, and as these notes are only published as an assistance to local collectors, I have used two names only, but have mentioned where any of the authorities consider any insect a local race.

In my personal experience the best places for a collector to go to, in order to make a fairly complete collection in a short time, are : (1) Wellawaya resthouse, in the Province of Uva. The best months are usually March, April, July, November, and December. About 160 species may be expected to be taken, including the rarities *S. nais* (abundant), *N. dana*, *C. lithargyria*, *H. nilgirica*, *L. lepitoides*, *A. siamica*, and *B. sena*. (2) Pattipola resthouse, for hill species ; best during the north-east monsoon. The special rarity is *L. dynsate*. (3) Murunkan resthouse, near Mannar, for Colotis and other northern and dry-zone species. (4) Kottawa resthouse, near Galle, for wet-zone species. I have also done very well at Elephant Pass (near Jaffna), Anuradhapura, Tissamaharama (Southern Province), and Tanamalwila (Province of Uva).

I understand that the Kandy District is better than Wellawaya, and that Ratnapura is the best centre for wet-zone insects, but I have very little personal experience of either.

Baits.—1. The best I know is small pieces of sponge soaked in toddy, in which a little jaggery has been dissolved. Pin these to trees, or lay them on rocks in likely places. A jam bottle is the best way to carry them. Squirrels are very fond of toddy, and will eat the sponges if left unwatched.

2. Treacle, or jaggery boiled in beer, with a good dash of rum added just before use. This is best for *Kallima* and *Charaxes*.

3. Over-ripe fruit, especially jak. This is best for *Discophora*.

4. A dead specimen pinned on a twig will often attract the males of its species within reach of the net.

Exceedingly little is known of our Ceylon butterflies. It is nearly impossible to decide how many species there are of *Nacaduba*, *Aphnæus*, *Terias*, *Parnara*, and a few other genera. *Appias paulina* is one of our commonest species, but I believe its larva is still unknown.

The southern half of the Island has been fairly well worked, except in the wettest districts, but practically nothing is known of the north, and new species should still be discovered there. In the Colombo Museum collection I found a pair of an *Aphnæus* from 20 miles north-east of Mannar which is very distinct from any species in our lists; and there are also two specimens of an *Arhopala* from Mr. Pole's collection which are certainly new; unfortunately they are not labelled with the locality where they were caught. I would especially impress upon beginners the importance of labelling every specimen with locality and month of capture. An unlabelled collection is nearly valueless for scientific purposes.

I have not quoted the localities given by Moore, as these notes are only intended as a supplement to that work.

In addition to the authorities quoted previously, I am much indebted to the following: "The Common Butterflies of the Plains of India," by T. R. Bell, I.F.S., now being published in the journal of the Bombay Natural History Society; and "Notes on the Butterflies of Ceylon," by L. de Niceville and Colonel N. Manders, R.A.M.C.

Ever since I started collecting I have received the greatest assistance from Mr. F. M. Mackwood, and I am deeply indebted to him for his help while writing these notes, and especially for, in a few instances, adding notes of his own.

For the benefit of beginners I give an illustration showing the names of the various parts of a butterfly's wings, as used in Colonel Bingham's work.

I shall be glad to receive any criticisms, corrections, or notes from collectors.

Kalupahani, Haldummulla, June, 1917.

Abbreviations after Names.

M. = Moore: Lepidoptera of Ceylon.

B. = Bingham: Fauna of India: Butterflies.

De N. = De Niceville: The Butterflies of India, Burma, and Ceylon, by Marshall and De Niceville.

E. = Evans: A List of Indian Butterflies.

NYMPHALIDÆ.

Danaïnæ.

1. *HÆSTIA JASONIA*, De N., B., & E.; *Nectaria jasonia*, M.—Peculiar to Ceylon. Common in forests where there is a fairly heavy rainfall. Occasionally specimens may be seen making long flights over the open country. In my experience these are always females, and are probably hunting for new breeding grounds.

The males are usually smaller and darker than the females, but there is great variation in specimens caught in different localities, those from the wet low-country being far smaller and darker than those from the hills. By far the smallest and darkest series I have ever seen were shown to me by Mr. Mackwood; they were caught at Badura Eliya in the Kalutara District in July.

Found at all elevations from sea level to well over 5,000 feet nearly all the year round, and is usually very easy to catch.

"I once caught twelve at one sweep of my net at a small pool in Pundalu-oya, and scores were hovering about" (F. M. Mackwood).

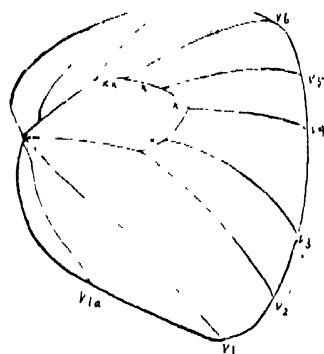
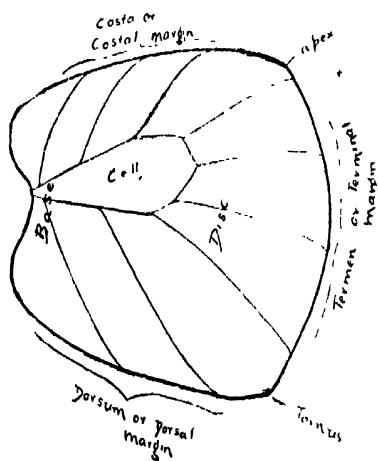
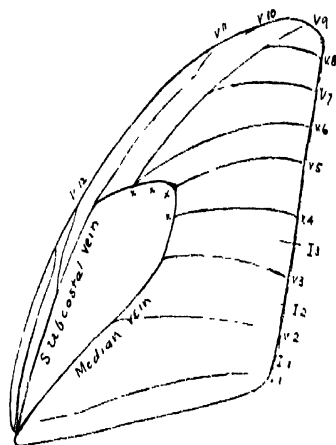
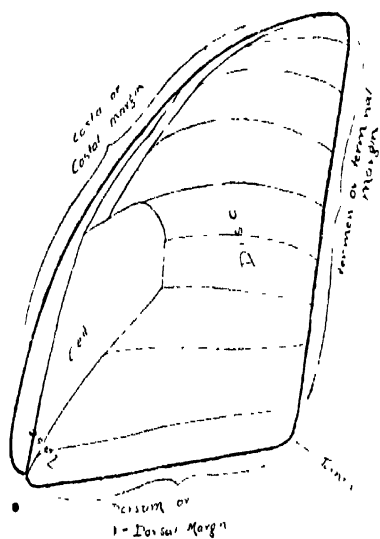
2. *RADENA EXPROMPTA*, M.; *Danaïs exprompta*, De N.; *Danaïs vulgaris exprompta*, B.; *Radena similis exprompta*, E.—Peculiar to Ceylon, and confined to the south-west of the Island. It is very like *P. aglea*, but can be easily distinguished by its bluer colour, and by having the cell of the fore-wing crossed by a broad black band.

It has a very slow flight and settles often, so is one of the easiest insects to catch.

The male has no sex mark, but has slightly narrower and less rounded wings than the female.

I found it very abundant in the Kottawa forest in February, and at Tebuwana in April. It is not rare at Galle, Bentota, and Labugama, and has been taken as far inland as Ratnapura.

3. *TIRUMALA LIMNIAE*, E.; *Tirumala limniacæ*, M.; *Danaïs limniacæ*, De N. & B.—Also found in India, Burma, and Southern China. A very common low-country fly, but occurs at all elevations during the flights.



xx = discocellulars 1
 V1 V2 etc vein 1 vein 2 etc
 I1 I2 = Interspace 1 2 etc

Has a strong flight while migrating, but at other times it flies slowly, and settles frequently on wet roads or at flowers. It is then very easy to catch.

Common all over the Island, and may be taken all the year round, but is most abundant during the north-east monsoon.

"Has been taken at Lindula at 5,000 feet" (F. M. Mackwood).

4. TIRUMALA SEPTENTRIONIS, M.; *Danaïs septentrionis*, B.; *Tirumala melissa musikanos*, E.—Found also in India, Burma, Malaya, &c.

Occurs in the same places, and at the same times as the last, but is far more numerous. It usually shares with *E. asela* the honour of starting the north-east monsoon flights. Its flight while migrating is much slower than that of *T. limniace*, and when not migrating it is not addicted to settling on wet roads; otherwise its habits are similar.

• Occasionally, during the flights, hundreds of their wings may be found in places along the roads. I believe this to be mainly the work of the White-bellied Drongo (*Dicrurus leucopygialis*), as I have seen this bird catching them, eating the body, and dropping the wings. I have also seen the blood-sucker lizard (*Calotes* sp.) eating them.

Found everywhere from Galle to Jaffna at all times, but commonest during the north-east monsoon.

"Taken at Lindula, 5,000 feet, in March and April" (F. M. Mackwood).

5. SALATURA CHRYSIPPUS, M. & E.; *Danaïs chrysippus*, B.—Found also in South-Eastern Europe, Africa, and Southern Asia.

The most sedentary of all the Ceylon Danaids; it may be found day after day in the same place; if disturbed it flies off, but soon returns. It does not apparently join in the flights.

Specimens from Haldummulla are usually much smaller than those from the low-country, although the food plant is very abundant here.

Found everywhere, all the year round.

Var. *dorippus*.—In this the white sub-apical band is wanting. It is very rare, the only specimens I have seen being four in the Colombo Museum collection.

Var. *alcippus*.—In this the lower wings are suffused with white. The Museum has two specimens, but I have seen no others.

I have a ♀ *chrysippus*, which shows a tendency to approach this form, veins 2, 3, 4, and 5 on the upper side of the hind wing being narrowly edged with white.

6. *SALATURA PLEXIPPUS*, E. ; *Salatura genutia*, M. ; *Danaïs genutia*, De N. ; *Danaïs plexippus*, B.—Found in India, Burma, Malaya, Southern China, &c.

A much more active insect than the last. Joins to a certain extent in the flights.

Common everywhere nearly all the year round.

Bell, in his description, says : “ Some specimens from dry regions show a tendency to replace the tawny part of the hind wing by white, thus approaching the next species ” (*S. hegesippus*).

I have noticed this variation, to a slight extent, occasionally in Ceylon, but it is not here confined to the dry zone, as I have found it most frequently at Galle and Haldummulla. In Ceylon, however, the dry regions have been, so far, very little worked, and little is known of the variations to be found there.

7. *PARANTICA AGLEA*, E. ; *Parantica ceylonica*, M. ; *Danaïs ceylanica*, De N. ; *Danaïs aglea*, B.—Found also in Southern India, and is very near to *P. melanoides*, which occurs in Northern and Eastern India.

Has a very slow flight, and settles often on flowers. Does not seem to join in the flights, though it is commonest when they are on.

Very common all the year round. I have not, however, yet seen it in the Northern Province; otherwise it seems to abound everywhere at all elevations.

Varies in size and the amount of the bluish-white markings.

8. *CHITTIRA FUMATA*, M. & E. ; *Danaïs taprobana*, De N. ; *Danaïs fumata*, B.—Peculiar to Ceylon, and confined to high elevations, where it is extremely abundant all the year round. It does not join in the flights. Flies very slowly, and settles frequently on flowers, so is very easy to catch.

It is especially numerous at Nuwara Eliya, Pattipola, and Ohiya, but is not rare, in wet weather, at Haldummulla. I

have never personally seen a specimen below 3,000 feet elevation, but have heard of its occurrence below 2,500 feet.

"The larva of *Danais fumata* feeds on *Alceophasia decipiens* Thw., a shrub growing in chenas at the higher elevations. Observer: Mr. F. G. Saunder, Nuwara Eliya."—" *Spalia Zeylanica*," Vol. X., Part XXXVI.

9. *EUPLOEA ASELA*, M.; *Crastia asela*, De N.; *Crastia core asela*, B. & E.—"More or less confined to Ceylon, though incidentally recorded from Western India" (Bingham). Only an insular race of *E. core* of India. Bingham says it differs from *E. core* in having the terminal and sub-terminal spots on the fore wing smaller. These spots are very variable; in my series they vary from three very indistinct spots to twenty-one in number; in the latter specimen those at the apex are very large and diffuse. They are, however, always very dull white or buff, and never as bright as in the specimens of *E. core* that I have seen. It is common all the year round everywhere, but is particularly abundant in the flights.

Settles readily at certain flowers, particularly *Gynura ceylanica* and a species of wild heliotrope; and I have frequently seen it in clusters, apparently feeding, at an exposed root or dead stick.

10. *EUPLOEA CORUS*, De N., B., & E.; *Macroploea elisa*, M.—Peculiar to Ceylon, and confined to the south-west of the Island, and apparently does not occur far inland.

It is said to have been formerly common at Colombo and Galle, but seems to be getting much scarcer. I have hunted for it at all seasons of the year at Galle, but, except on one occasion, have only seen single specimens. The furthest inland I have seen it is at Kottawa, ten miles from Galle.

Its flight is slow, and it settles often, so it is very easy to catch.

11. *SALPINX SINHALA*, De N.; *Isamia sinhala*, M.; *Salpinx kollari sinhala*, B.; *Salpinx klugii sinhala*, E.—Peculiar to Ceylon, but is only an insular race of *S. kollari* of India, from which it differs in the same way that *asela* differs from *core*, and it varies almost as much as *asela* in the number and size of the spots.

A common insect in the drier low-country. It often joins in the flights, and in December, 1902, it was for a few days by far the commonest *Euploea* in the flight.

It is very common at Wellawaya, in the low-country of Uva, and at Anuradhapura. I have also taken it at Galle and Jaffna.

It is not found at high elevations, except during the flights.

12. *STICLOPLÆA MONTANA*, De N. ; *Narmada montana*, M. ; *Stictoploea corela montana*, B. & E.—Peculiar to Ceylon, but is only a race of the Indian *S. corela*, from which it differs in the same way as *asela* from *core* and *sinhala* from *kollari*.

It is almost as abundant as *asela* in the flights, but does not usually appear till they have been on for some days.

Like *sinhala*, it does not seem to remain at high elevations after the flights end, but it is then common in many parts of the low-country, particularly in the dry zone.

The females of the three species *asela*, *sinhala*, and *montana* are difficult to distinguish. The usual rule is—

A.—Under side fore wing : no spot in cell = *sinhala*.

B.—Under side fore wing : white spot in cell :

A 1.—No spots outside cell above veins 5 and 6 = *asela*.

B 1.—Complete series of spots between nerves immediately outside cell = *montana*.

I have specimens of both *asela* and *montana* without the spot in the cell. This variety is quite common. I have also—

Montana : Only 4 spots outside cell ; no spot above vein 5.

Asela : 6 spots outside cell ; spot above vein 6.

In my series of *montana*, the spots outside cell vary from 4 to 7. In *asela* from 3 to 6.

Mr. A. C. Hayley has called my attention to another means of distinguishing them, which, to judge from the specimens in my collection, seems reliable.

In interspace 1 on the under side of the fore wing—

♀ *asela* has one long milky white streak (about 10 mm. long).

♀ *montana* has two similar streaks.

♀ *sinhala* has a very minute white streak, or narrow spot, seldom over 2 mm. in length.

The males can be easily distinguished by the sex mark, which is a black shiny mark in interspace 1 of the upper side of the fore wing, as follows :—

One short narrow streak = *asela*.

Two long rather broad streaks = *montana*.

One short oval spot = *sinhala*.

Satyrinae.

13. *ORSOTRICENA MANDATA*, M. & De N. ; *Orsotricena meda mandata*, B. & E.—Found also in Southern India.

“ It differs from *O. meda* in the white discal band on the under side being very much broader, and proportionately more attenuate apically ” (Bingham).

It is very common here nearly all the year round in grass by the road sides or near jungle, but it does not usually frequent the open patanas away from jungle. It is common in growing paddy.

It usually varies very little in the wet or dry seasons, or at high or low elevations. I have, however, one specimen caught at Kumbukkan (500 feet) after a severe drought.

In this the white band is only half the usual width, the ocelli are much smaller, and the white marginal and sub-marginal bands on the hind wing are further apart. Others caught at the same time were quite normal.

It is common all over the southern part of the Island from sea level to over 4,000 feet, but I have not yet seen it in the Northern or North-Central Provinces.

It sometimes comes to sugar.

“ Taken at Lindula, 5,000 feet, in October ” (F. M. Mackwood).

14. *CALYSISME PERSEUS*.—Moore also gives *C. blasius*, which is the wet season form.—Found in India, Burma, Malaya, Southern China, &c. Very common at Haldummulla on grass by the road sides, or on patanas, especially above 3,000 feet.

I have found it equally plentiful at Elpitiya, in the Southern Province, on patana very little above sea level, and have taken it at Galle and Kumbukkan (Uva, 500 feet). I have never seen it in the Northern Province.

The wet and dry season forms fly together here, but all my Elpitiya specimens are wet season.

Varies very greatly in the ocelli, both on upper and under sides, and seems to grade into the next species (*C. polydecta*).

Comes to sugar occasionally.

15. CALYSISME POLYDECTA, De N.; *Calysisme mineus*, M.; *Calysisme mineus polydecta*, B. & E.—Also found in Southern and Central India. Bingham says: "There are no constant characters by which this race may be distinguished from *M. mineus*." Common in grass by the road sides, but especially an insect of the patanas. Those taken on patanas in Uva, from 500 to 2,000 feet elevation, are usually larger and more conspicuously marked than those from higher elevations.

I have no specimens from outside the Province of Uva, and have no notes of its occurrence, but believe it occurs everywhere in the hills.

It is very easy to breed, as the females lay eggs freely in captivity.

"Ratnapura and Kandy" (F. M. Mackwood).

16. CALYSISME SUBDITA, B.; *Calysisme perseoides subdita*, E.—Also found in Southern India. Not mentioned by Moore, as it only differs from *polydecta* in the sex mark of the male being much larger, and this was not regarded as a distinguishing mark when the "Lepidoptera of Ceylon" was published.

Common on the road sides at Haldummulla, especially in May, June, and July, but I have not yet taken it above 3,000 feet.

It is the only *Calysisme* I have taken in the Northern Province. It is common at Anuradhapura, and occurs sparingly in the Jaffna Peninsula. Rare at Galle.

It seems to come to sugar more readily than *perseus* or *polydecta*, and is very easy to breed.

"Kandy and Ratnapura" (F. M. Mackwood).

The last three species are exceedingly difficult to distinguish. The males of *perseus* and *polydecta* have a small dark brown sex mark near the dorsal margin of the under side of the fore.

wing; *subdita* has a much larger ochreous one. Bingham discriminates the two former by hind wing under side:—

Posterior three ocelli only in a straight line = *perseus*.

Posterior four ocelli straight = *polydecta*.

From my specimens this does not seem entirely reliable, as I have very typical *polydecta* in which the last four ocelli are not straight, though not so much out of line as in typical *perseus*.

Personally I know no rule by which I can separate the two with certainty, as they grade almost perfectly into one another.

C. subdita has a far larger and lighter sex mark than either, but the female is, so far as I can see, quite indistinguishable from *polydecta* ♀.

The breeding experiments I have carried out so far are quite inconclusive. Being bred where the female was caught, they have, as was to be expected, bred fairly true. The very small number of collectors in the Island prohibits experiments being carried out on a large enough scale to settle the question.

17. CALYSISME RAMA, E.; *Calysisme drusia*, M.—Peculiar to Ceylon, and only found in the wet zone. Moore describes *C. drusia* from a single specimen taken in the Kottawa forest. *C. rama* has been taken there, and Moore's description agrees fairly well with it.

I procured specimens of the dry season form from Ratnapura in March, 1917. It differs in having the ocelli and other markings on the under side more or less obsolescent and the ground colour paler. The upper side is almost identical with that of the wet season form in both sexes.

Till recently it was only known from specimens taken at Udagama (near Kottawa) by the late Mr. John Pole. It has now been discovered to be quite common in bamboo jungle at Ratnapura.

I have never taken it personally, but have specimens given to me by Mr. Mackwood from Ratnapura, and some caught by a native collector at Kottawa.

It can be distinguished at once by the colour of the under side, which is *ochreous* brown; viz., far more yellow than in any other Ceylon *Calysisme*.

"Also Kalani Valley" (F. M. Mackwood).

18. NISSANGA PATNIA, M. & E.; *Mycalesis patnia*, B.—Peculiar to Ceylon. Very common at Haldummulla all the year round. Frequents jungle or shady road sides. Swarms on the fallen fruit of Ficus and other trees, and comes readily to toddy or sugar, but is easily alarmed.

The dry and wet season forms at Haldummulla vary very little, those caught during the drought, June–September, being only a little brighter in colour than those taken during the November–December rains. Very dark forms may be taken in some wet districts, and I procured a fine series at Kandy in June, after a very wet May, and at Deniyaya (Southern Province) in April.

I have never seen it in the Northern Province, but it is very common in the south, at Galle and other places.

19. LETHE DYSNATE, B. & De N.; *Debis dysnate*, E.; *Hanipha dysnate* and *sihala*, M.—Peculiar to Ceylon, and a great rarity. Moore separates the variety from the hills as *H. sihala*. He says the ♀ differs from ♀ *dysnate* as follows: Narrower discal band on fore wing, more defined apical white and black spots on fore wing, under side fore wing has five sub-marginal spots instead of four, hind wing has all the spots smaller.

I find in my specimens that all the apical white and black spots on the fore wing, upper side, are better developed in my low-country specimen, which also has the fifth sub-marginal spot on the under side, though it is partly obliterated by the extra width of the white discal band.

The male of the hill form is not described by Moore.

Mine have the terminal margin of the fore wing less concave than my Ratnapura specimens, and the ocelli on the under side of the hind wing are exceedingly minute.

I have no personal experience of the habits of the low-country form, as I owe my specimens to Mr. Mackwood's generosity, but I have seen a fair number of the males of the hill form in the jungles from Haputale to Ohiya and the Horton Plains. On a fine morning they fly rapidly round the tree tops, usually settling high up. Occasionally they descend within reach, and a very quick stroke will catch them. Unfortunately their wings are very fragile, and the stroke must be quick, so I have damaged all I have caught.

I have tried sugaring for them, without result so far, but am confident that they will come, if I can find the right bait.

20. *LETHE DRYPETIS*, M., De N., & B.; *Lethe drypetis todara*, E.—De Niceville thought *drypetis* and *todara* were identical, *todara* being a name given to South Indian specimens, and *drypetis* to Ceylon ones. Evans gives the name *todara* to Ceylon specimens, which he thinks a distinct race. It varies very little in Ceylon, specimens from Ratnapura, taken during the rains, being almost identical with those from Haputale, taken during the drought.

Apparently found in all bamboo jungle where there is a good rainfall, and occurs at all elevations from sea level to the Horton Plains. Very common at Haputale, there being apparently many broods in the course of the year.

It comes readily to toddy, treacle, &c.

Localities: Haldummulla, Haputale, Ohiya, Kandy, Kegalla, Ratnapura, and Galle.

“Pundalu-oya” (F. M. Mackwood).

21. *LETHE NEELGHERIENSIS*, M. & De N.; *Lethe rohria nilgiriensis*, B.; *Lethe dyrtia nilgiriensis*, E.—Also found in Southern India.

De Niceville considers it “notably distinct” from *L. dyrtia* (= *rohria*).

The male differs from ♂ *rohria* in having a fourth white spot on the upper side of the fore wing, in interspace 2. I have two specimens, taken at Kandy and Haldummulla respectively, in which this spot is practically obsolete.

The female differs in having the white pre-apical band on the fore wing broken up into three white spots. I have noticed no tendency in these spots to unite and form a band.

The larva feeds on grasses; the butterfly is very common at Haldummulla in grass fields and chenas, and is very easy to catch, as it only flies a very short distance at a time. It comes occasionally to sugar.

Taken from 1,000 to 5,000 feet elevation in Uva, but I have no notes of its capture out of the Province, except the one specimen from Kandy. I believe it to be common everywhere in the hills. Flies all the year round.

"Puttalam, Kandy, Ratnapura, common at Lindula" (F. M. Mackwood).

22. *LETHE DARETIS*.—Peculiar to Ceylon, and confined to high elevations. Personally I have never taken it below 4,500 feet.

It is nearly always to be found settled on the banks where the earth has been cut away to make a road, and never very far from a bamboo clump.

If disturbed, it flies away rapidly, but soon settles again. Its wings are very fragile, and it is easily damaged by the net. It comes readily to toddy, &c.

February and August are, in my experience, the best months for fresh-hatched specimens, but a few may be taken all the year round.

Localities : Nuwara Eliya, Horton Plains, Ohiya, &c.

23. *YPITHIMA SINGALA*, M. & De N.; *Ypthima avanta singala*, B.; *Thymipa avanta singala*, E.—Also found in India.

Moore also gives *Y. thora*, but it is certainly only a variety. It differs only in having a minute sub-apical bi-pupilled ocellus on the upper side of the fore wing of the male.

The number of ocelli on the under side of the hind wing varies in my specimens from 4 to 7, and is not always the same on both wings. They also vary as much in size as in number; but this does not seem to depend on season or climate, except that I have only taken a variety with the ocelli reduced to mere specks at the highest elevations.

Specimens from Elpitiya, near Galle, taken during the rains, agree very well with those taken at Haldummulla during the drought, except that var. *thora* was proportionately more abundant at the lower elevation.

Common all over the Uva patanas from 500 to over 5,000 feet; Galaha, near Kandy; and Elpitiya, near Galle. Flies all the year round at Haldummulla.

"Also Galboda and Pundalu-oya" (F. M. Mackwood).

24. *YPITHIMA CEYLONICA*, M., De N., & E.; *Ypthima hübneri ceylonica*, B.—Also found in Southern India.

Common everywhere all the year round, especially along road sides. The variation in the size of the ocelli in this species seems largely to depend on temperature. I have taken

specimens with exceptionally large ocelli at Kottawa (wet zone) and Jaffna (dry zone). They vary slightly, according to the season, at Haldummulla.

I have noticed swallows eating them. I have a variety of the female in which the ground colour is very pale ochreous brown.

25. *MELANITIS ISMENE*, M. & B.; *Melanitis leda ismene*, E.—Also found in Africa, Asia, and Australia.

Moore divides *ismene* and *leda* as two species. Bingham says *ismene* is the dry and *leda* the wet season form; *leda* I have found commonest in growing paddy; elsewhere *ismene* is far more plentiful, at any rate in Uva.

As regards the under side, this is the most variable butterfly in Ceylon, and the variations, in the *ismene* form, do not seem to be dependent on climate or elevation.

Flies very little in the day time, but starts at dusk, when it has a very jerky and fairly rapid flight, and is not easy to catch. The bad light, of course, is against success. Comes very readily to sugar after dark till, at any rate, 9 P.M. It also comes in the day time in shady places, but is very shy then.

Very common, and flies all the year round. I have taken a few specimens in the Jaffna peninsula (all *ismene* form).

26. *MELANITIS TAMBRA*, M.; *Melanitis bela tambra*, B.; *Melanitis phedima tambra*, E.—Peculiar to Ceylon.

Much more a jungle butterfly than the last, especially the black, or wet season, form. The red, or dry season, form seems particularly fond of the shade of jak trees, and its under side, when settled, matches the dead leaves well. The black form is much the rarer here, and always settles on the ground in the thickest undergrowth, so is difficult to capture, except at sugar.

In habits otherwise they are similar to *ismene*, flying little by day, but coming out at dusk. They come to sugar in the same manner, but are, perhaps, even more shy in the day time. I have not yet succeeded in getting the female to lay eggs in captivity. I have specimens from Haldummulla, Kandy, Ratnapura, and Kottawa.

"Caught also at Hambantota" (F. M. Mackwood).

27. *ELYMNIA FRATERNA*, M.; *Elymnias undularis fraterna* B., *Elymnias hypermnestra fraterna*, E.—Peculiar to Ceylon but De Niceville thinks it only a local variety of *E. undularis*. He says the female is identical, and the male only differs in the narrower ferruginous border of the hind wing, and in having scarcely any traces of the blue marks on the fore wing.

Bingham says the ♂ differs in having the terminal margin of hind wing ochraceous, not chestnut. ♀ has the oblique preapical white band on fore wing narrow, its margins even.

The males in Ceylon are extremely variable. In those in my collection the width of the ferruginous band, taken at the widest spot, viz., vein 4, varies from 6 to 10 mm. In one the fore wing is entirely blackish-brown, with no trace of blue. In a second the colour is the same, with three very conspicuous elongated sub-apical blue spots. In a third there is a terminal marginal border of ferruginous, narrowing from the apex to the tornus, and two faint sub-apical blue streaks. In a fourth there is a complete row of sub-terminal blue spots, much elongated at the apex, thus approaching very near to *undularis*, but the terminal border on the hind wing is exceptionally pale and wide, and has white sub-terminal spots in interspaces 2, 3, and 4.

The female varies much in the width of the sub-apical white band.

The flight is slow, and it always settles low down, though very seldom actually on the ground. The female is a mimic of *S. plexippus*. In most cases of mimicry in Ceylon an experienced collector can usually distinguish the mimic by its different flight. *E. fraterna*, however, is far better as a mimic on the wing than in the cabinet, and very frequently deceives me. Possibly this may be due to the fact that it usually flies low, and is seen from above, as a bird would probably see it. If seen from below the under side would, of course, destroy the illusion.

Rare at Haldummulla, but very common in the coconut districts, especially where the palms are low, in new clearings; &c. The larvæ and pupæ may often be found on pot palms in low-country verandahs.

Found from sea level up to at least 3,000 feet. I have found it commonest at Kurunegala, Polgahawela, and the southern sea coast from Ambalangoda to Weligama.

28. *ELYMNIA SINGHALA*, M. & B.; *Dyctis singhala*, De N.; *Melynia singhala*, E.—Peculiar to Ceylon.

Peradeniya is the headquarters of this insect, but it occurs sparingly in widely scattered localities. I have caught four specimens only at Haldummulla, two in 1889, when I was starting my Ceylon collection, and therefore catching everything, and one each in November of 1914 and 1915.

It is very like an *Euplaea* on the wing, and so I believe often escapes notice. It is very easy to catch when identified.

It is rare in the Kottawa forest.

“ Numerous in Ratnapura District ” (F. M. Mackwood).

Morphinæ.

29. *DISCOPHORA LEPIDA*.—Also found in Southern India.

The male varies much in the number and size of the ocelli on the under side of the hind wing. I have one specimen with five perfectly formed and fairly large ocelli.

A great rarity till its habits became known; the male is now easily obtainable, but the female is a prize.

The male flies all the year round, but does not appear till dusk. It has its particular haunts, and a few may be found there any evening, flying backwards and forwards, with a very jerky and rather fast flight. Thanks to the bad light, they are then difficult to catch. I have searched frequently in a small jungle where I knew there were plenty, but have never succeeded in putting up a male in the day time. The only two females I have seen on the wing were both flying in the middle of the day. The ♂ comes readily to sugar as soon as it is dark; the ♀ is said to come in the day time (especially to over-ripe jak fruit), but is very shy. Possibly, like *M. ismene*, both would come better at night, and be easier to catch. Personally I have not yet tried sugaring for them after 7 P.M.

Bell says the females come to meet the males in their evening flight, and thinks they are attracted by the strong scent the males are notorious for. He describes the scent as that of a mixture of apples and lemons. (“ Common Butterflies of the

Plains of India.") If this is so, the females might be caught by enclosing a few males in a muslin cage, and watching near, preferably after dark.

A well-known haunt of the males is behind Kottawa rest-house, where the stream leaves the jungle.

Common at Galle, Ratnapura, Balangoda, Avissawella, and probably in all bamboo jungle in the south-west of the Island.

Nymphalinx.

30. *HARIDRA PSAPHON*, M. & E.; *Charaxes psaphon*, B.—Moore describes the ♀ as *Haridra serendiba*. Peculiar to Ceylon, but allied to *H. imna* of Southern India.

Not at all a rare fly in the low-country, but it is difficult to capture, especially the female.

The male is very fond of settling on wet roads, and can also be taken feeding on sap exuding from the trees, or on sugar. It is rather shy when settled on the roads, but I caught half a dozen at one patch of sap, and it was difficult to make them fly.

The female is far more often seen at Haldunmulla than the male. It is then nearly always flying straight and very fast; it never seems to settle, and is almost impossible to catch. It is evidently migrating in search of fresh breeding grounds. I have seen it once at sugar; the moment the net approached it shammed dead and fell into the undergrowth and escaped.

It is commonest in Uva during the south-west monsoon, but may be taken in March and April. It does not seem to fly above an elevation of about 3,000 feet.

"Caught at Kandy, Dambool, and Trincomalee" (F. M. Mackwood).

31. *CHARAXES FABIVS*, M., De N., & B.; *Haridra fabius*, E.—Also found in India and Burma.

In habits it is very much like the ♂ *psaphon*.

It is very frequently seen on the wet roads in the low-country of Uva, and comes readily to sugar. It is rather rare at Haldummulla, and I have never seen it above 3,000 feet.

May be found all the year round. I have taken it at Jaffna, Anuradhapura, and Trincomalee, and it is probably to be found wherever the tamarind tree flourishes.

32. *EULEPIS ATHAMAS*, B. & De N. ; *Eulepis samatha*, M. ; *Eulepis athamas agrarius*, E.

E. athamas is found all over India and Burma. Messrs. Rothschild and Jordan, however, separate *agrarius* as a race occurring in Southern India and Ceylon. It varies a great deal in the width of the yellow band and the size of the two pre-apical spots.

Very common at Haldummulla, especially during the south-west monsoon, and I have taken it at Haputale (5,000 feet).

It may be found day after day in the same place. It settles high up on a leaf, and flies round very fast, returning to the same place, and is very difficult to catch. It comes occasionally to sugar, especially if mixed with well-fermented toddy, but it much prefers carrion.

I have noted it at Haldummulla all the year round, except in the strong wind in January and February, and have also taken it at Kandy, Rambukkana, and Trincomalee.

"In my experience the ♀ is exceedingly rare, as regards captures" (F. M. Mackwood).

33. *ROHANA CAMIBA*, M. ; *Apatura camiba*, De N. ; *Rohana parisatis camiba*, E. ; *Apatura parisatis camiba*, B.—The race *camiba* is also found in Southern India. *Parisatis* is found in Northern India, Burma, Indo-China, and Southern China.

It differs from *parisatis* in the number of the very minute pre-apical white spots in both sexes. In the ♂, *camiba* has three spots, *parisatis* only one. In the female, *camiba* has four or five spots, *parisatis* usually three.

Two of the four specimens of ♂ *camiba* in my collection have four white spots, but the fourth is minute, and may escape notice ; another has four on one wing and three on the other.

The females are extremely variable in colour and clearness of markings.

The male is common and easy to capture, but it nearly always manages to rub its wings badly in the net. The female is much scarcer, and is usually found in jungle ; it also seems very hard to capture in good condition.

Found up to 6,000 feet elevation, or higher.

Localities : Haldummulla, Haputale, Ohiya, Kandy, Kegalla, Trincomalee, &c.

34. *PARTHENOS CYANEUS*, M.; *Parthenos virens cyaneus*, B.; *Parthenos gambrisius cyaneus*, E.—Peculiar to Ceylon. It varies very little, and seems to be a well-established race or sub-species.

Above 2,500 feet it seems rarely to settle, but is always seen flying fast and straight across country. In the low-country its behaviour is quite different; it is usually found in jungle, and settles high up in the trees, going off occasionally for a rapid fly round, but nearly always returning to the same spot. From this I fancy that the up-country specimens are probably all females searching for new breeding grounds. Unfortunately they are very hard to catch, so I cannot be certain.

Occurs at Haldummulla all the year round. In December and January the high wind sometimes forces them to settle in the tea, and they are then easy to catch.

I have taken them on the Horton Plains (7,200 feet), and at Haputale (5,000 feet). Wellawaya (600 feet), Ratnapura, Kottawa, and Kegalla, and believe they are common wherever there is a fair rainfall.

“Plentiful at Henaratgoda Gardens at times and at Kandy” (F. M. Mackwood).

35. *SYMPHÆDRA NAIS*, M. & De N.; *Euthalia nais*, B. & E.—Also found in Southern India and the Himalayas.

Very variable in the amount of black on the upper side and white below.

Very unlike the other *Euthalias* in Ceylon, both in appearance and habits, except that both sexes come readily to toddy. The latter are far more like those of a *Junonia*. It almost invariably settles on the ground, and if disturbed, flies very quickly for a short distance, returning to the original spot, usually in a few minutes. Very rarely individuals seem to be afflicted with the migrating mania, and may be met a few miles from their haunts, flying very fast and straight. These sometimes settle, but if disturbed go on straight away. I have noticed them in March and August on this estate, going straight in the direction of Adam's Peak. If these are efforts to find new breeding grounds, they do not appear to be very successful.

They are, so far as I am aware, only common in one very limited area in Ceylon, viz., a stretch of quartz patana, reaching from Ranungahawa, four miles below Haldummulla, to Kumbukkan (25 to 30 miles).

This patana crosses the Wellawaya-Haldummulla road near the 127th milepost; the butterfly can nearly always be taken there. I have found it abundant there in March, May, and August, and at other parts of the patana in July and November.

36. *DOPHLA EVELINA*, M., B., & E.; *Euthalia evelina*, De N.—Peculiar to Ceylon, but very near *D. laudabilis* of Southern India.

Occasionally very common in parts of the low-country of Uva, but very rarely comes above 2,000 feet. It is fond of settling in wet sand on the river beds, or where sap is exuding from a tree, and both sexes come very readily to toddy.

The largest numbers I have ever seen were at Hambegama tank in June. It is not rare at Wellawaya, and I have taken it once at Haldummulla, 2,500 feet. Very plentiful at the hot springs near Trincomalee in November.

“Anuradhapura, Labugama, Ratnapura” (F. M. Mackwood).

37. *EUTHALIA LUBENTINA*.—Also found in India, Burma, Malaya, China, &c.

The Ceylon race is now said to be distinct, and has been named *psillacus*.

The larva feeds on *Loranthus*, and the insect is nearly as widely distributed as the food plant, but it seems to be common nowhere. I have taken it on fallen nutmegs near Galle, in sandy river beds in the low-country of Uva, on a *Duranta* hedge in my garden (3,000 feet), and in jungle above Haputale (over 5,000 feet). I have specimens from Kandy and Ratnapura, and know of its capture at Badulla.

The sexes seem to occur in about equal numbers, and both come to sugar, or settle on wet sand. In this latter characteristic the *Euthalias* differ from the majority of Ceylon butterflies, as, in other genera, those settling on wet roads or in sandy river beds are almost invariably males. *Appias*, *Catopsilia*, and *Libythea* are the only others I can remember that agree with the *Euthalias* in this respect.

“Comes to fallen fruit under lime trees” (F. M. Mackwood).

38. EUTHALIA GARUDA, M., B., & De N. ; *Euthalia garuda diversa*, E.—Found in India, Burma, Malaya, &c.

Bingham says the ♂ *vasanta* differs from the ♂ *garuda* in having no white spots on the fore wing. If this is correct, *garuda* has a certain claim to a place in a Ceylon list. My experience is that at least 20 per cent. of the males I have seen have shown signs of these white spots, many having a complete series of four discal and two sub-apical spots. Mr. Mackwood, who has been collecting for fifty years in the Island, has never seen a Ceylon specimen of a ♀ *garuda*, so I think there can be no doubt that it does not exist, but that the ♂ *vasanta* is variable, and approaches very near to *garuda* in markings. Four males in the Museum collection show the white spots well ; they are labelled *garuda*.

39. EUTHALIA VASANTA, M., De N., & E. ; *Euthalia garuda vasanta*, B.—Peculiar to Ceylon.

The larva feeds on mango and cashew-nut trees, and the butterfly is to be found wherever these grow, though I have not yet seen it in Jaffna.

Both sexes are equally common and have the same habits. They are fond of settling on wet roads, and come readily to decaying fruit or sugar. They are rather shy and have a very strong flight, so are not easy to catch in perfect condition.

The male varies as already stated (see remarks on *garuda*) ; the female varies in the width of the white discal band, but it is always straight from the costa to interspace 2, not at all resembling that of the ♀ *garuda*.

Localities : Colombo, Kandy, Galle, Kegalla, Trincomalee, Haldummulla, &c.

40. MODUZA CALIDASA, M. ; *Moduza calidasa*, De N. ; *Moduza procris calidasa*, B. & E.—Peculiar to Ceylon.

De Niceville thought it " quite distinct " from *procris*. It differs from it in its quite different ground colour, different shape of the white discal band, and entire absence of the white spot at the end of the cell. Moreover, in no specimen that I have seen is there any tendency to grade.

May be found at Haldummulla all the year round, but is commonest during the south-west monsoon.

It settles frequently on flowers, but is extremely shy and difficult to catch. In the dry low-country it settles on the wet roads; I have never known it come to sugar.

Localities: from sea level to over 5,000 feet. Common at Haputale and Namunukula (high), Haldummulla and Badulla (medium), and Wellawaya (low), in the Province of Uva. Common at Kottawa.

"Extremely plentiful at times in the Kandy District at lantana" (F. M. Mackwood).

41. NEPTIS JUMBAH, B. & De N.; *Neptis jumba*, M.; *Andrapana jumbah*, E.—Also found in India and Burma. Ceylon specimens have recently been named *nalanda*, as a separate race. It varies extremely in the amount of white on the upper side and the black shadings below.

Common at Haldummulla all the year round, except during the heavy winds in January and February. It joins in the flights in large numbers, and when these are on it can be easily captured by walking it up in the tea in the early morning, as it then only flies a short distance. Later, when the sun gets hot, it flies straight and seldom settles. When not fighting it settles freely on *Lantana* and other flowers.

Localities: from sea level to the Horton Plains, and from Galle to Vavuniya. I have, so far, no notes of its occurrence north of the latter place.

42. NEPTIS VARMONA, M. & De N.; *Neptis eurynome*, B.; *Neptis hylas varmona*, E.—Also in India. It differs mainly from *eurynome* in being smaller.

Extremely abundant everywhere, though more so in the south than in the north. Freshly-hatched specimens can be taken in every month of the year at Haldummulla. It does not join the flights.

Considering its abundance at all seasons and elevations, it varies extremely little, but aberrations, such as *N. disrupta*, Moore, are occasionally met with. *Disrupta* and *kamarupa* are now given as the names of the extreme wet and dry season forms respectively of the Ceylon race. Personally I have failed to observe any tendency to seasonal variation here, and consider *disrupta* to be only an aberration. I do not know *kamarupa*.

In *Neptis* the males can be distinguished from the females by the enlargement of the costa of the hind wings, the distance between vein 8 and the costa being twice as broad in the male as in the female.

43. *RAHINDA SINUATA*, M. & De N.; *Rahinda hordonia sinuata*, B. & E.—Peculiar to Ceylon. It differs constantly from *hordonia* "in the margins of the discal markings (especially the outer margins) on the upper side of the fore wing and the margins of the sub-basal and post-discal bands of the hind wing being more sinuous" (Bingham). It varies considerably in the amount of yellow on the upper side.

Very common at Haldummulla in jungles or chenas where there are plenty of thorny *Acacias*. It is fond of settling rather high up on these, but if disturbed only flies a short distance, so can usually be driven to a more favourable spot for capture. Especially common in May and June.

Found from 500 to over 5,000 feet elevation in Uva. I have also taken it at Madampe and Ratnapura, and believe it to be common everywhere in the hills.

44. *JUNONIA IPHITA*, B. & E.; *Precis iphita*, M. & De N.—Also found in India, Burma, Malaya, and China. Very abundant everywhere nearly all the year round. Appears in great numbers in the flights, especially in November-December. Except during these flights, specimens taken in the hills are usually ragged and faded. I have seen it in thousands in the sandy beds of low-country rivers, when practically every specimen appeared to be newly hatched out. From this I imagine it mainly breeds at low elevations.

45. *JUNONIA ATLITES*, B., De N., & E.; *Precis laomedea*, M.—*Laomedea* is the wet season form. Also found in India, Burma, Malaya, &c.

In habits it is very much like the last, but it is rather scarcer up-country, and even fair specimens are much harder to get in the hills. I have seen it plentiful on the sea beach in the south, particularly at Calle in September. These all appeared to be freshly hatched. It appears up-country usually in October, before the regular flights begin, and the swarm only lasts a few days. Stragglers are fairly plentiful in November and December, but for the rest of the year they are scarce.

I have no records of its occurrence in the Northern Province, or at any very high elevation. It is extremely abundant at Kurunegala and Polgahawela in November.

"I have caught it at Anuradhapura and Pattipola" (F. M. Mackwood).

46. JUNONIA ORITHYA, M. & B.; *Junonia orithya*, De N. & E.—Found also in India, Burma, Southern China, &c.

Does not join in the flights. It is extremely common all the year round in the grass fields on this estate, and all places round Haldummulla where the grass is fairly short. It is easily alarmed, and flies fast for a short distance. It never seems to fly far, but can be found in the same spots day after day. It usually settles on the ground, except when roosting for the night, when it selects a low plant about a foot or less in height. It can be walked up in the late evening, and is then very easy to catch.

It is extremely variable. Specimens from the Northern Province are much smaller than those from Haldummulla. The costa and apical markings on the fore wing are nearly pure white, whereas in the hill specimens they are pale buff; the under side also is much lighter. Specimens from the low-country of Uva taken during the dry season are intermediate between the two forms. The female is also extremely variable, at all seasons and localities, in the amount of blue on the lower wings.

Found everywhere from Galle to Jaffna, and from sea level to over 6,000 feet.

47. JUNONIA HIERTA, De N., B., & E.; *Junonia aenone*, M.—Also found in India, Burma, and Southern China. Mainly confined to the Northern Province.

I have seen it in great numbers at Kankesanturai in December and January. It is common at Elephant Pass, but specimens there are much smaller than those from the north coast. I have also taken it at Giant's tank, and two specimens at Anuradhapura. Its habits are similar to those of *J. orithya*.

In 1916 this butterfly appeared at Trincomalee, Kandy, Colombo, Galle, and Tangalla, where it had not been seen for many years past. Specimens I caught were in perfect condition,

and certainly did not look as if they had "flighted" for any great distance.

The female varies a great deal, especially as regards the blue spot on the lower wing. Often it is entirely absent, while in other specimens it is as large as that of the male, but of a more lilac shade.

48. *JUNONIA LEMONIAS*.—Also in India, Burma, Malaya, China, &c. Occasionally very numerous at Haldummulla during the flights in November-December, but does not appear as regularly as *J. iphita* or *atlites*.

In the low-country of Uva it is common nearly all the year round. It is particularly fond of settling on wet roads or in the sandy beds of rivers.

The under side is extremely variable, and the variation does not seem to depend much upon season.

I have one specimen caught at Haldummulla, in which the under side is of a bright peach colour.

Found everywhere, though I have no records of its capture at the highest elevations. It is extremely plentiful in the Northern Province.

49. *JUNONIA ALMANA*, B. & E.; *Junonia asterie*, M.—Also found in India, Burma, Malaya, China, Japan, Dutch Indies, &c.

J. asterie is the wet season form of *J. almana*. The dry season form is rare in Ceylon, and I have never caught it, but Mr. Mackwood has shown me one or two specimens. It should be plentiful in the Northern Province.

Almana is rather rare at Haldummulla, though single ones sometimes appear, chiefly in the south-west monsoon. These are almost invariably poor specimens. It is very abundant all over the low-country from Galle to Jaffna, especially in chenas, paddy fields, and the borders of tanks.

50. *CUPHA PLACIDA*, M. & B.; *Cupha erymanthis placida*, E.—Peculiar to Ceylon.

It differs from *erymanthis* as follows: "Fore wing: discal band distinctly darker yellow, with its inner and outer margins much less sinuous and irregular, the black line defining the inner margin more slender; the spots on the band in interspaces 1, 2, and 3 much smaller, especially the spot in interspace 1, which is no larger than the others, and is

diffuse and ill-defined. The sub-apical yellow spots on the black area entirely wanting, or, if present, diffuse and indistinct" (Bingham).

My specimens vary greatly in all these respects. In nearly all my specimens the spot in interspace 1 is far larger than those in 2 and 3, though not so large as in Bingham's figure of *erymanthis*.

Common wherever there is a fair rainfall. It always seems abundant at Watering Point, Galle, but is found at all elevations, and apparently all the year round. I have never seen it north of Vavuniya.

It settles on bushes usually about 5 to 8 feet from the ground. If disturbed, it dives into the thickest growth, and is therefore very difficult to capture in first class condition.

51. *CETHOSIA NIETNERI*.—Peculiar to Ceylon.

I have records of its occurrence at Haldummulla in every month but January, but it is most numerous during the south-west monsoon.

It is one of the easiest insects to catch, owing to its slow hovering flight; its wings are not so delicate as they look, and are seldom damaged in the net.

It usually varies little, except in size, but I have one male in which the ochraceous patch on both wings is missing.

Found all over the low-country from Galle to Vavuniya, and up to 6,000 feet (Ohiya) at least, but it seems to be most plentiful at a fair elevation, say 2,000 to 4,000 feet.

52. *CYNTHIA ASELA*, M., De N., & B.; *Cynthia erota asela*, E.—Peculiar to Ceylon.

"♂ absolutely indistinguishable from the wet season form of *E. erota*" (Bingham). The female differs in having the white discal band very much narrower and only extending to vein 6 on the hind wing, whereas in *erota* it extends to vein 2. The series of females in the Colombo Museum vary extremely in the width of this white band. In some it is almost obsolete on the hind wing, in others it extends to vein 5. In two of my specimens it just extends over vein 6.

The male is common at Haldummulla from May to August. It usually basks high up on trees, taking short flights and returning to the same spot. It is also very frequently found

settled on wet patches on the roads. It is then very easy to approach and capture. The female is rarer, and is usually seen flying fast and straight; it, however, stops at flowers occasionally. I once saw a large number at the blossom of *Acacia cæsia* while travelling in the coach from Kegalla to Polgahawela.

Localities: Galle, Kandy, Wellawaya, Nuwara Eliya. "Ratnapura" (F. M. Mackwood).

53. *CIRROCHROA LANKA*; *Cirrochroa thais lanka*, E.—Moore separates it into *thais*, *lanka*, and *cognata*, and De Niceville added *swinhœi*.

It is very questionable whether our Ceylon specimens are distinct from the South Indian *thais*. Bingham says: "After carefully examining a long series of specimens from Southern India and Ceylon, I am quite unable to find any constant characters that would serve to distinguish *C. lanka*, Moore, from *C. thais*, Fabr."

He entirely ignores *cognata* and *swinhœi*.

Personally I agree with him that there is only one species in Ceylon. The more specimens I examine, the greater difficulty I find in splitting up the species. It is exceedingly variable, but all varieties seem to grade.

The males can be usually distinguished by the entirely different shape of the fore wings. They also have a sex-mark, the terminal half of veins 5, 6, and 7 being coloured black, with a narrow yellow margin of specialized scales.

On one occasion, in November, I was walking from Wellawaya to Koslanda, and on the first five miles of the road there were many thousands of the males settled on the wet patches. Both sexes often settle at flowers, but I have not found it easy to catch perfect females.

About twelve years ago I found a small tree on Eadella estate, Polgahawela, entirely defoliated by the larvæ. I collected a few pupæ, but they had evidently been starved, as all hatched out dwarfed or deformed.

I have notes of its occurrence in every month at Haldumulla, but it is only plentiful in the flights.

Other localities: Galle, Kegalla, Wellawaya, Anuradhapura, Trincomalee, &c. "Matale and Ratnapura" (F. M. Mackwood).

54. *HYPOLIMNAS BOLINA*.—Moore also gives *facintha*, which is only a variety. Found also in Southern Asia and Australia.

In his key to the genus *Hypolimnas*, Bingham says *Bolina* can be distinguished by having "fore and hind wings with a post-discal series of white spots always present." Specimens can be found in Ceylon with no trace of these spots on the fore wing, and only very minute specks on the hind wing.

Common at Haldummulla all the year round, but especially in December, when it appears in swarms in the tea. By walking it up in the evening, after it has gone to roost, it can easily be captured in any number, and a fine series of varieties selected. As is usual in Ceylon, both dry and wet season forms fly together.

The male is an exceptionally long-lived fly. A battered specimen will take up its position on one branch for several weeks, flying off to attack any fair-sized butterfly that passes. I have known them drive away *Kallimas* that wished to settle on sugar. They do not seem to be attacked at all by birds, or to take the slightest notice of them.

Localities : everywhere from sea level to Nuwara Eliya.

55. *HYPOLIMNAS MISIPPUS*, De N., B., & E.; *Apatura misippus*, M.—Found in Asia, Africa, Australia, and North America.

Usually rather rare at Haldummulla, except at one spot in the tea here, where there is frequently a single male. In December, however, it often appears in great numbers. In these swarms the females are much commoner than the males, which is unusual at other times. The *chrysippus* form is always much commoner than the *dorippus* one, though the latter is often plentiful. On one occasion I was walking to Tanamalwila, on the Wellawaya-Hambantota road, and *misippus* was in thousands, both males and females, settling on the road from about the 36th to the 28th mile. I could have caught any number of the *dorippus* variety, but could not find one perfect specimen. In the north, where the *chrysippus* form is abundant, I have only twice seen the *dorippus* form.

The *alcippus* form, with white lower wings, is not, I believe, found in Ceylon, but I have caught a specimen at Jaffna with a small but conspicuous white patch on the upper side of the lower wing.

Localities : it seems to prefer the drier portions of the Island, though it occasionally visits the wet zone.

56. *VANESSA CARDUI*, B. & E. ; *Pyrameis cardui*, M. & De N.—Commonly known as the Painted Lady.

Found all over the world, from New York to Nuwara Eliya.

Single specimens may be seen anywhere all the year round, but in many localities great numbers suddenly appear, though it does not seem to flight.

I have noticed these big hatches at Galle (twice) and Jaffna. I have also found the larvæ in great abundance at Galaha, near Kandy.

“ Caught on the very top of Pedrotalagala ” (F. M. Mackwood).

57. *VANESSA INDICA*, B. ; *Pyrameis indica*, M. & De N. ; *Vanessa indica nubicola*, E.—The form *nubicola* is restricted to Southern India and Ceylon, but it is doubtful if it is distinct from *indica*, which is found in Southern Europe, Canaries, China, Japan, &c.

It is said to differ from *indica*, in that “ the outer margin of the hind wing is comparatively much more broadly black.”

I have never caught this butterfly below 4,500 feet, but it is very common at times above that elevation.

It is not difficult to catch, but the easiest way to get perfect specimens is to collect the pupæ.

The larvæ feed on *Heterophylla palmata*, and tie the leaves into a ball about the size of an orange ; the pupæ can be found inside these balls, which are very conspicuous. The best implements for collecting them are a pair of scissors and a biscuit tin, as the sting of the nettle is painful, though it passes off quickly.

In Vol. VII., Part 38, of “ Spolia Zeylanica,” Mr. E. E. Green describes two abnormal varieties of this hatched from larvæ brought down from Diyatalawa to Peradeniya, where they pupated. He thought the aberration might be due to

change of climate. I have taken pupæ from Haputale to Galle in the hottest months, but all have hatched normal. I could not get food for the larvæ there, or would have tried with them.

Localities : Haputale, Ohiya, Pattipola, Nuwara Eliya, &c.

58. VANESSA HARONICA, M. & De N.; *Vanessa canace haronica*, B.; *Kaniska canace haronica*, E.—Peculiar to Ceylon.

It differs from *canace* as follows : " The broad blue band is discal, not post-discal, and anteriorly is continuous with the broad short oblique bar beyond the cell, not commencing, as in *canace*, below the pre-apical white spot. On the hind wing the band is without the series of black spots, but beyond it there is a transverse post-discal row of small blue spots " (Bingham).

Specimens showing any signs of grading into *canace* are very rare. There is one specimen in the Museum collection in which the blue band on the upper wing is distinctly forked, the outer branch continuing to the pre-apical white spot. In a few cases, where the blue band is especially wide, there are distinct signs of the post-discal black spots on the lower wing. In general appearance, however, the two butterflies are very distinct.

Moreover, according to authorities quoted by Bingham, their larvæ are most distinct, as follows :—

Canace.—" Segments alternately orange and white, with numerous black spots on the orange segments, and black streaks on the white. Seven white branching black-tipped spines on each orange segment."

Haronica.—" Light red, spotted with black, the segments divided by blackish and purplish lines, anal segment slightly humped, segments armed with eight longitudinal rows of yellow branched spines."

Very common at Haldummulla and fairly easy to catch. It comes readily to sugar, but is very shy. Very common at Haputale and Ohiya, but seems scarcer at lower elevations, though a few have been taken at Galle.

" Very plentiful in the highest mountain passes, Matale to Rangalla " (F. M. Mackwood).

59. *KALLIMA PHILARCHUS*, M.; *Kallima horsfieldi*, B.; *Kallima horsfieldi philarchus*, E.—Peculiar to Ceylon, but is very near *K. horsfieldi* of Southern India. It differs in being rather larger and of a more brilliant blue, but is subject to considerable seasonal variation.

Rare at Haldummulla, except occasionally in December. The flight nearly always starts in Christmas week, and usually only lasts a few days. In December, 1914, they arrived early in December, and were plentiful for the whole of that month, but at Haputale, Ohiya, &c., viz., at a higher elevation, they remained in fair numbers till April. During these flights they are common on the Horton Plains (7,000 feet), but seldom seem to reach Nuwara Eliya. In parts of the low-country of Uva they are usually very abundant in July, but very few of this brood migrate up-country. They are extremely easy to catch, as they cannot refuse toddy, treacle, &c., especially mixed with rum.

They are pursued by Drongoes (*Dicrurus leucopygialis*), but I have never seen one eaten, the bird almost invariably taking a triangular piece out of one of the lower wings. Whether he finds this distasteful or not I cannot say, but he never seems to continue the pursuit of that individual, though the next one to pass is probably treated in the same manner. At least 50 per cent. of those taken at sugar in open country will be found to have been damaged. The birds seem quite unable to see them when settled, though they do not make the most of their resemblance to a dead leaf. If settled on a twig with the tail towards the base and the fore wing well drawn out, the resemblance is perfect; but they usually settle with their heads towards the base, and the fore wing more than half covered by the lower, when the resemblance is far inferior.

“Of late fairly plentiful at Kandy and Ratnapura” (F. M. Mackwood).

60. *DOLESCHALLIA BISALTIDE*, M.; *Doleschallia polibete*, De N.; *Doleschallia bisaltide malabarica*, B.; *Doleschallia bisaltide ceylonica*, E.—Evans writes in his list: “There is not sufficient material in the British Museum to judge whether these races are worth retaining.”

It varies a little on the upper side, but very greatly on the under side in Ceylon specimens.

Usually very rare at Haldummulla, but sometimes appears in fair numbers in the tea in November and December. It settles, usually low down, on the side of a tea bush, so only gives room for a very awkward stroke with the net between the bushes; it also requires very careful stalking, so is not easy to catch. I have never succeeded in attracting it with sugar or other baits.

Localities: Kandy, Badulla, &c. "Ratnapura" (F. M. Mackwood).

61. ARGYNNIS HYPERBIUS, B.; *Acidalia niphe*, M.; *Argynnis hyperbius taprobana*, E.—*A. hyperbius* is found in India, Burma, Abyssinia, China, Japan, &c., but it is possible that our Ceylon specimens form a local race, though they only differ in the slightly darker ground colour. They vary extremely little. It is common at high elevations nearly all the year round, and is usually found on the patanas near jungle. It settles on the ground, or low down, and is very easy to catch, as it only flies a short distance if disturbed.

I have seen one straggler (♀) as low as Haldummulla (3,000 feet), but it is very rare below 4,500 feet.

Localities: Nuwara Eliya, Horton Plains, Haputale, Maskeliya; in fact, wherever the wild violet grows.

62. ATELLA PHALANTA, M. & E.; *Atella phalantha*, De N. & B.—Found in Africa, India, Burma, Malaya, China, &c.

Common at Haldummulla nearly all the year round, except in September and October, viz., the end of the dry season. Sometimes it flights in very great numbers. When fighting, it goes fairly fast and straight, but at other times it settles on flowers, &c., and is very easy to catch. In the dry low-country it swarms on wet patches on the roads.

Common from Galle to Jaffna and at all elevations up to 6,000 feet at least.

63. ATELLA OBYLONICA; *Atella alcippe ceylonica*, B. & E.—Peculiar to Ceylon. Differs from *alcippe* "in the broad immaculate black apex of the fore wing in both sexes and on the greater breadth of the terminal band on both fore and hind wings" (Bingham).

I know nothing of this, so asked Mr. Mackwood for particulars. He writes: "*Atella ceylonica* is a distinct species or sub-species. Major Manders described it. So far it has only appeared in one valley in the Nitre Cave, surrounded by 6,000 feet hills, except towards the north-west and east, where it faces the Bintenna country. The butterflies are found from 2,000 to 4,000 feet. Principal appearance, May-June. A few at end of the year."

I possess a pair given to me by Mr. Mackwood.

64. *ERGOLIS TAPROBANA*, M. & De N.; *Ergolis merione taprobana*, B. & E.—Also found in Southern India. A well-defined race, which, in Ceylon at any rate, shows very little variation.

Common all over the Island up to 6,000 feet at least. The wings, especially of the females, seem to split extremely easily, and perfect specimens are not easy to procure.

Found at Haldummulla all the year round, but is only numerous in the flights. I have seen it at Galle, Jaffna, Mannar, &c., and up to 6,000 feet at Ohiya.

65. *ERGOLIS ARIADNE*, De N., B., & E.; *Ergolis minorata*, M.—Also in India, Burma, Malaya, Formosa, &c.

Flights with the last at Haldummulla, but is rather more numerous. It is far easier to catch perfect.

It is found in the same localities as the last, viz., all over the Island.

66. *BYBLIA ILITHYIA*, M., De N., & B.; *Byblia ilithia*, E.—Central and Southern India, Africa, Arabia, &c.

An extremely local fly, and is apparently gregarious. In March, 1909, I found numbers settled on a small bush at Palatupane, in the Hambantota District, but in all my subsequent visits there I have never seen another specimen.

I have specimens from Anuradhapura and Giant's tank, and caught one very battered female at Kankesanturai, probably the sole survivor of a brood.

It is apparently confined to the driest districts of the Island.

If disturbed, it flies off fast and low, but is almost certain to return in a few minutes, and can be found in the same place day after day.

Acraëinæ.

67. *TELCHINIA VIOLEÆ*.—Also found in India.

Very common everywhere, from sea level to 6,000 feet at least. I have seen it in every month at Haldummulla. Prefers open country to jungle, and is very easy to catch. It can be found in the same place day after day, and if disturbed seldom goes more than a few yards.

LEMONIIDÆ.

Libythæinæ.

{ 68. *LIBYTHEA MYRRHA*.

{ 69. *LIBYTHEA RAMA*.—*L. myrrha* is found in India, Burma, Malaya, and China. *L. rama* is a race or variety from Southern India and Ceylon.

Bingham says : “ Var. *rama*, Moore, is the smaller southern and Ceylon form, with the orange markings much narrower and restricted, and the pre-apical double spots entirely white, or white slightly suffused with yellow.”

My specimens of *rama* also differ from *myrrha* in the shape and colour of the lower wings, which are more scalloped along the termen, and on the under side variegated with light and dark gray ; while in *myrrha* they are uniformly coloured, without conspicuous markings.

Both forms fly together at Haldummulla and show very slight signs of grading, but in a large number of specimens which I have examined the “ *rama* ” are always males and the “ *myrrha* ” always females. This seems to point to the conclusion that they are the same insect, and that *rama* is a race in which the male has varied from the original stock far more than the female. This point can, of course, be settled at once by breeding. The sexes can be easily distinguished by the fact that the fore-legs of the ♂ are short hairy brushes, while those of the ♀ are functionally perfect.

They are almost always found settled on wet roads. If disturbed, they usually only fly a few yards, but if frequently put up, they may fly a little way off the road and settle on the bushes or grass ; but in fine weather they are certain to return to the road in a few minutes.

Both forms are plentiful at Haldummulla, but probably *ten rama* will be seen for one *myrrha*.

They are found from 500 to 5,000 feet in Uva, but so far I have not taken them out of the Province.

70. *LIBYTHEA LEPTOIDES*; *Libythea celtis leptoides*, B. & E.—*Libythea celtis* is found in Europe, Asia Minor, and Chitral. *Leptoides* is peculiar to Southern India and Ceylon. It differs from *celtis* in the different shape of the hind wing, different shape of the orange band on the fore wing, and absence of an orange spot in interspace 1.

It differs from *lepita* in having the orange band divided, and all the sub-apical spots white.

It is very rare. I have only caught a single specimen at Haldummulla, and have seen others caught at Badulla and Wellawaya.

The Colombo Museum has a good series, mainly from the Kandy District.

“Found also at Dambool” (F. M. Mackwood).

Nemeobiinæ.

71. *ABISARA PRUNOSA*, M.; *Abisara echerius*, De N. & B.; *Abisara echerius prunosa*, E.—The race is confined to Southern India and Ceylon. De Niceville thinks it identical with *echerius*. Bingham does not mention *prunosa*. Evans says *prunosa* is larger and brighter.

I have a ♀ caught at Haputale in March (cold, dry season, elevation 5,000 feet). It is much darker than usual, and the post-discal fascia is almost obsolete. The black spots on the lower wing are very minute. The under side is very like Bingham's illustration of the dry season form of *echerius*. It is very unlike any specimen of *prunosa* I have seen.

It is almost always found in jungle. During the day time it usually settles on a leaf five or six feet from the ground. If disturbed it flies a yard or two and settles again. In the evenings, however, its flight completely changes, and it darts up and down a jungle path with a quick jerky flight, so that I have more than once mistaken it for one of the *Hesperiidæ*.

It is commonest at Haldammulla during the dry weather in the south-west monsoon.

I have taken it at Jaffna, Kandy, Galle, Trincomalee, Ratnapura, and up to 5,000 feet at Haputale.

"Caught at Colombo" (F. M. Mackwood).

LYCENIDÆ.

Lycæninæ.

72. NEOPITHECOPS ZALMORA, B. & E.; *Pithecopos dharma*, M.—Found in Southern Asia.

One of the most variable insects in Ceylon. The amount of white on the upper side varies as much in location as in amount. The principal varieties in my series are:—

(1) Upper side: both wings black, minute white speck or pale patch on disc of fore wing.

(2) Discal white spot on fore wing much larger. Lower wing with a large white patch from the cell to the margin, between veins 4 and 7.

(3) Fore wing about half white. Lower wing with five very minute sub-marginal white spots. The markings on the under side almost obsolete, except the black sub-costal spot on hind wing. (Only taken at over 5,000 feet elevation.)

Very common at times at Haldummulla, and apparently flights. A great number appeared in August, 1915, all flying west. They settle frequently, and usually close to the ground, and are easy to catch. Their wings, however, are very frequently rubbed in the net.

I have taken it from 500 to over 5,000 feet elevation in Uva. Also at Galle, Ratnapura, Trincomalee, Vavuniya, &c.

73. SPALGIS EPIUS.—Also found in India, Burma, Java, Borneo, &c.

The male can be distinguished by its very sharp-pointed wings.

The larva feeds on coccidæ (scale insects), especially "mealy bug," and is never known to eat vegetable food.

May be taken at Haldummulla all the year round, but is never numerous. I have also taken it at Galle, Kegalla, and Kandy.

"Found in the North-Central Province" (F. M. Mackwood).

73 A. SPALGIS EPIUS NUBILUS, B. & E.—Bingham gives this race also from Ceylon, and says two typical specimens in

the British Museum are labelled "Trincomalee, Ceylon." Evans restricts it to the Andamans and Northern India.

It differs from *epius* as follows: Much darker ground colour, no white spot on fore wing of ♂, and only a slight pale patch on ♀.

S. epius varies considerably in the size of the white patch, especially the female, but I have not yet come across a specimen answering the description of *nubilus*. I have, however, no specimens from the dry zone, and this form may occur there.

74. *MEGISBA MALAYA*, B. & E.; *Megisba thuaitesi*, M.—Found in Southern Asia.

In India two forms exist: tailed and tailless. In Ceylon none have tails.

The upper side does not vary much, though the white patch is occasionally rather indistinct. The under side is variable, and the spot in the cell of the fore wing is often wanting in the female.

The male is very abundant at times in the low-country of Uva, and may be found in dozens settled on wet sand in river beds or on wet roads.

The female, which has more rounded wings, is much scarcer.

Single specimens may be taken at Haldummulla all the year round, but I have no notes of its capture above 4,000 feet.

Other localities: Galle, Kegalla, Jaffna, Trincomalee, &c. "Colombo to Kandy, Ratnapura" (F. M. Mackwood).

75. *CHILADES LAIUS*, B. & E.; *Chilades varunana*, M.—Also in India, China, Formosa, &c.

Varunana is the wet season form. Both dry and wet season forms are very common almost everywhere in Ceylon. The dry season forms (with clouded brown patch on under side of lower wing) are rather scarcer than the others, but both fly together.

The ♀ varies very much in the amount of blue.

Can be taken all the year round at Haldummulla, but is only abundant here during the north-east monsoon flights, when it is occasionally the commonest blue for a week or two.

I have taken it everywhere up to 6,000 feet: It is plentiful at Nuwara Eliya at times.

76. *CHILADES PUTLI*, M. ; *Chilades trochilus*, B. ; *Chilades trochilus pulli*, E.—Also found in Europe, Asia, Africa, and Australia.

Bingham says var. *pulli* is only the small Indian form, which is identical with *trochilus* in ground colour and markings. It is very variable in these respects and in size, and in the number of the metallic green spots on the under side of the lower wing.

It is so small that it may be easily overlooked, though it is generally found fluttering over the shortest grass, or nearly bare ground.

Essentially a low-country insect, but I took one specimen in January and another in May, 1916, on this estate (3,000 feet). These are both above the average in size.

Localities : the lawn in front of the Colombo Museum, Jaffna (very abundant), Mannar, Hambantota, Wellawaya, &c.

77. *CYANIRIS AKASA*.—Also in Southern India, Java, Sumatra, &c.

A very local insect, but plentiful where it occurs. It is usually found near streams in the hills, the male settling on wet patches on the roads, the female hovering among the bushes, and settling frequently on flowers.

It varies very little in Ceylon. The figure in Bingham is not at all like our specimens. In neither male nor female is the black border of the upper wing extended to the tornus.

Common at Haldummulla and Haputale, especially during the north-east monsoon, March and April being the best months. Also taken at Nuwara Eliya.

“Pundalu-oya and Pattipola” (F. M. Mackwood).

Note.—The genus *Cyaniris* is now named *Lycenopsis* by many writers.

78. *CYANIRIS PUSPA*, B. & E. ; *Cyaniris lavendularis*, M.—Found also in India and Malaya.

“Var. *lavendularis*, Moore, has the costal and terminal margins of both fore and hind wings more narrowly bordered with black than in typical *puspa*, but seems otherwise indistinguishable” (Bingham).

This seems a very constant feature of the males in Ceylon, and it is questionable if Moore's name should not stand for the race.

The males vary a great deal in the shade of blue, the amount of white, especially on the lower wing, and the clearness of the black marginal spots on the lower wing. Bingham says of these spots in *pampa* that "these are formed, not by actual scaling, but by the dark markings of the under side, which show through more or less clearly." This is not the case with Ceylon specimens, as the spots on the upper side are frequently far larger than those on the under side, and are occasionally very large and distinct above, when almost obsolete below. The female varies chiefly in the markings on the under side; in some specimens these are comparatively small and indistinct, especially on the hind wing.

The male is often very plentiful in the low-country of Uva, settled in river beds and on wet roads. It occasionally can be taken at Haldummulla. The female is very common at Haldummulla at times, and is apparently given to fighting. I have taken it here in every month but February and March.

The female bears no resemblance at all to the figure given in Moore.

79. *CYANARIS SINGALENSIS*, M. & E.; *Cyaniris huegeli singalensis*, B.—Found in Ceylon, Java, and Sumatra.

Originally described from specimens taken at "Kalupahana, about 3,000 feet." I have no doubt this estate is referred to.

The male is very plentiful at high elevations. It is chiefly found settling in stream beds or on wet roads. Occasionally I have taken specimens at Haldummulla, but they do not seem to descend below 3,000 feet. The female I have found extremely rare, and I know nothing of its habits.

"♂ numerous at Maskeliya and the Horton Plains; ♀ scarce" (F. M. Mackwood).

80. *CYANIRIS LANKA*.—Peculiar to Ceylon.

The male is extremely plentiful at high elevations. At Ohiya, Pattipola, &c., it is usually the commonest blue. It sometimes descends as low as 3,000 feet. It is nearly always found settled on damp spots on the roads. The female flies low over the bushes, settling occasionally on flowers. I have never taken one lower than 5,500 feet.

"The larva feeds on *Smithia blanda*, which grows in damper portions of patanas. The egg is deposited on the stem at

the foot of the flower bud" (F. M. Mackwood in "Spolia Zeylanica," Vol. X., Part XXXVI.).

"Taken also in Kandy District" (F. M. Mackwood).

81. *CYANIRIS LIMBATA*, B. & E.; *Cyaniris limbatus*, De N.—Also in India and Sumatra. Not mentioned by Moore.

Not common at Haldummulla. The male settles on wet roads in April, May, September, and October. The female is a great rarity. I have never taken the males anywhere else than at Haldummulla, but I have taken the females at Haputale and Ohiya as well.

The male is intermediate between *lanka* and *singalensis*. The upper side is much darker than *singalensis*, but not so dark as *lanka*. The marginal spots on the under side in both sexes on both wings are enclosed in a lunular gray line in *limbata* and *singalensis*; this is absent in *lanka*. The upper side of the female is very distinct from either ♀ *lanka* or *singalensis*.

"♂ taken at Kandy, Pundalu-oya, and Maskeliya" (F. M. Mackwood).

82. *ZIZERA LYSIMON*, B. & E.; *Zizera karsandra*, M.—Also in Europe, Africa, Southern Asia, and Australia.

"Var. *karsandra*, Moore, is a pale form of *lysimon*" (Bingham).

It very closely resembles *Z. indica*, but can be distinguished by the presence of a black spot in the cell on under side of fore wing.

I have a curious variety, of which I took four specimens on a small patch of grass on one day, in which there is a quite irregular dusting of small black spots, ringed with white, between the disco-cellular streak and the line of discal spots. One specimen has four of these spots on one wing and three on the other. In April, 1916, I took a ♂ *Z. gaika* showing the same aberration.

Specimens from Jaffna have the marginal bands and spots very clearly defined, and one specimen taken there, a female, measures 26 mm. in expanse.

Common everywhere in short grass from sea level to 5,000 feet at least. It occurs all the year round here, but is commonest in August and September.

63. *ZIZERA GAIKA*, B. & E. ; *Zizera pygmaea*, M.—Found also in Africa, Arabia, India, and Malaya.

Very common at low elevations, but gets scarcer above 3,000 feet. It may be found all the year round at Haldummulla, but is commonest in August. Usually found flying over short grass.

Localities : the low-country from Galle to Jaffna, but commonest in the drier districts.

84. *ZIZERA INDICA*, M. ; *Zizera otis*, B. ; *Zizera otis indica*, E.—Found also in India, Burma, Malaya, Hong Kong, and Philippines.

Bingham says *indica* differs from *otis* in the great size of the discal black spots on the under side of the fore wing.

These spots vary very much in size, shape, and position, and the two posterior ones are often obsolete.

Very common everywhere from Galle to Jaffna, and from sea level to the Horton Plains. I have taken it in every month at Haldummulla.

85. *AZANUS UBALDUS*.—Found in India and Arabia. Not mentioned by Moore.

The only place where I have caught this insect is at Elephant Pass, in the Jaffna Peninsula. It is fairly common there in December, but is very likely to escape notice. It is very small, and settles usually at a fair height from the ground, at the end of a twig or thorn. If disturbed, it flies round quickly, but soon settles in a similar place, and is not hard to catch. When settled, it is very like a small specimen of the next species, *A. jesous*, but that seldom settles so high up.

Since writing the above I have found it common near Giant's tank in July.

86. *AZANUS JESOUS*, B. ; *Azanus crameri*, M. ; *Azanus jesous gamra*, E.—Found in Africa, Arabia, and India.

Very common in the dry low-country, and is an occasional visitor to Haldummulla, all caught here being males. It flies low, and is fond of settling at the end of a twig or large thorn, whence it apparently can get a clear view round. It is seldom seen more than two or three feet from the ground. It is usually found along road-sides in open country or scrub, very seldom in jungle.

Localities : Jaffna, Mannar, Anuradhapura, Wellawaya, Hambantota, &c.

" Abundant at Trincomalee " (F. M. Mackwood).

87. *LYCÆNESTHES LYCÆNINA*.—Also in India, Malaya, and Dutch Indies.

The male is very common at Haldummulla, and is always found settled on wet roads or in the beds of streams, especially from March to May. If disturbed, it flies round very rapidly, but settles again quickly, and will allow one to miss it several times with the net before clearing off. The female is rarer here, and may be found settled on the tea or on flowers. I found it very plentiful on the tea at Kegalla, but I never saw a male settled on the wet roads there.

Other localities : Galle, Hambantota, Wellawaya, &c.

" Colombo, Kandy, and Pussellawa " (F. M. Mackwood).

88. *TALICADA NYSEUS*.—Also in India and Burma.

Exceedingly common wherever its food plant (*Bryophyllum*) grows. It flies slowly, and settles frequently. In the evenings it generally roosts on flower heads, and generally in groups of four or five. It is very conspicuous, and can be easily caught then in a killing bottle, and the finest specimens and unusual varieties of under sides can be selected. It does not retire till rather late, so there is not much time to take them before dark.

The upper side varies little, but specimens with the red patch replaced by buff may be taken. The under side is variable, especially in the number of black spots on the lower wing.

I have now taken four specimens of a peculiar aberration, with a conspicuous irregular white patch between the black and red on the upper side of the lower wing. One was taken in 1902, two in 1912, and one in 1915. All four were taken at the same spot, within a few yards of the 106½ milepost on the Haldummulla road. This rather points to its being hereditary.

One is figured in "*Spolia Zeylanica*," Vol. IX., Part XXXIII.

Plentiful all the year round at Haldummulla, and I have taken it at Galle, Hambantota, Wellawaya, Kandy, &c.

89. *EVERES PARRHASIUS*, M.; *Everes argiades*, B. & De N.; *Everes argiades parrhasius*, E.—*Argiades* is found in Europe, Asia, Australia, &c., and is said to have been taken near Dover. The limits of *parrhasius* do not seem to be defined yet.

Microscopical examination of the scales of the male has proved *parrhasius* to be distinct from *argiades*.

Exceedingly plentiful all the year round at Haldummulla. Common at Galle and all over the southern half of the Island up to 6,000 feet at least. I have no records of its capture in the North.

The male varies little, except in size; the female varies greatly, the ground colour being sometimes brown without a sign of blue, and at others pale grayish-blue with brown border at the apex and termen of the fore wing, and along the costa of the hind wing.

NACADUBA.—This is one of the most difficult families to name, and apparently the more specimens one examines, the greater the difficulty becomes. During the last five or six years I have caught and examined many hundreds of specimens, and I now feel less competent to name them than ever.

As a guide of sorts, I annex a table, mainly taken from Bingham :—

Key to Forms of Ceylon Nacaduba.

A.—Under side fore wing : basal area unmarked by white strigæ :

a1.—White strigæ very broad and diffuse = *macrophthalma*.

b1.—White strigæ narrow, never diffuse = *pavana*.

B.—White strigæ on basal area :

a2.—Fore wing : apex very acute = *viola*.

b2.—Fore wing : apex not very acute :

a3.—Basal strigæ not extended to vein 1 :

a4.—Under side hind wing : small black spot in tornal angle, and larger one in interspace 2 = *noreia*.

b4.—Under side hind wing : small black spot in tornal angle, and equally small one in interspace 2 = *dana*.

b3.—Basal strigæ extended to vein 1 :

a5.—Expanse under 25 mm. = *ardates*, tailed and tailless.

b5.—Expanse over 25 mm. :

a6.—♂ upper side : brownish-purple = *atrata*.

b6.—♂ upper side : darker brownish-purple suffused with plumbeous = *plumbeomicans*.

The great objection to this table is that it largely depends on the old fallacy, that "the exception proves the rule."

For instance, the *atrata* group are separated from *ardates* by the question of size, all under 25 mm. being classed as the latter. My smallest specimens are the white variety of female *atrata*, and a variety which was fighting in great numbers in September, 1915, which is certainly not *ardates*, but probably a dwarf form of *plumbeomicans*.

Again, an important division depends on whether the basal pair of strigæ are continued to vein 1. I have a series of tailed *ardates*, otherwise quite normal, showing every graduation, from the strigæ stopping at the median vein till they reach vein 1.

As our knowledge now stands, it is nearly impossible to say how many species we have in Ceylon.

90. *NACADUBA MACROPTHALMA*.—Found in India, Malaya, and Australia.

91. *NACADUBA PAVANA*.—Found in India, Burma, Java, &c.

The latter is not mentioned in Moore. This group is unfortunately rare at Haldummulla, so I have a comparatively poor series. My specimens are easily divided into two groups :—

(1) Male very large, my largest being 39 mm. in expanse ; white strigæ on under side rather broad and diffuse. Female : blue area very large, extending to at least four-fifths of the posterior portion of fore wing ; veins across the blue area very clearly marked in dark brown ; under side, white markings more diffuse. This, I take it, is a form of *macrophthalma*.

(2) Male smaller, average about 30 mm., darker in colour on upper side, white strigæ on under side narrower and more clearly defined. Female ; blue area darker, and much reduced in size ; the veins very indistinctly marked ; under side white strigæ clearly defined, but broader than in the male, a complete series of dark oval spots along margin of fore wing and along hind wing down to interspace 2.

The female is usually much smaller than the male, one of mine measuring only 22 mm.

This I believe to be *pavana*, though it is considerably larger than the specimens of *pavana* I have seen from the Andamans.

N. macrophthalma is not rare in parts of the low-country of Uva and at Ratnapura, but I have taken very few specimens as high as 3,000 feet.

N. pavana is not rare at Galle and elsewhere in the wet zone, and I have a few specimens from Haldummulla.

Both forms vary enormously in almost every particular, but I have insufficient material to hazard any opinion as to how the group may be subdivided in Ceylon.

92. *NACADUBA VIOLA*, M. & E.; *Nacaduba hermus*, B. & De N.—Also found in India, Burma, Malaya, and Australia.

Very rare. I have taken about half a dozen males settled on wet roads in Haldummulla, but I have never seen a female. I have seen a male caught at Hirumbara, near Galle, and another from Deniyaya.

It can be distinguished at once from any other Ceylon *nacaduba* by its very pointed wings. It varies very much in size.

93. *NACADUBA DANA*.—Also in India, Burma, &c. Not mentioned by Moore.

This can be at once recognized by the fact that it is the only Ceylon *nacaduba* which does not possess the conspicuous large black spot in interspace 2 of the under side of the hind wing. There is only a minute spot, nearly equal in size to the one in the tornal angle.

It is not given in any of the Ceylon lists, but I have taken more than a dozen males settled on wet roads, or in beds of streams, at Haldummulla, and in May, 1916, I found it very abundant at Wellawaya, and also took one at Tanamalwila, on the borders of the Southern and Uva Provinces. I have also got it from Ratnapura.

It is tailless, and may easily be mistaken for a tailless *ardates* when settled, but is of a distinctly lighter blue when flying.

The female is very rare, and I have only taken two specimens.

One of my specimens (a ♂) is in the British Museum. It is labelled *Wellunawittia*, but there is nothing else to show that it is a Ceylon specimen. It was sent there by the late Mr. John Pele.

In May, 1916, I took a butterfly at Wellawaya in company with a lot of *N. dana*, which is entirely unlike any other *Lycaenid* I have ever seen. The upper side matched *dana*, except for a regular, rather broad, black border to both wings. The under side is dark gray. Unmarked, except for a short pair of strigæ above the end of the cell on the upper wing. It may be an aberration of *dana*.

94. *NACADUBA ATRATA*.—Also found in India, Malaya, and Java.

95. *NACADUBA PLUMBEOMICANS*.—Also found in India.

Moore does not give *plumbeomicans*, but divides our Ceylon specimens into *prominens* and *atrata*.

I have caught many hundreds of these in the last few years for examination, and have over a hundred selected specimens now in my collection.

Both sexes vary very much in the colour of the upper side, the markings of the under side, and in size (18–36 mm. expanse). The extreme specimens are very distinct, and correspond almost exactly in colour, &c., to the two divisions of the *macrophthalma* group, but all are so variable, and there are so many intermediate forms, that it is almost impossible to decide if they belong to one species or to several. Personally I have roughly divided the males into four groups, and the females into three, but it is not easy to draw the lines between them.

Moore divided them by the markings on the under sides, but these grade perfectly in both sexes.

De Nicéville says *plumbeomicans* differs from *prominens* "in its slightly paler colouration on the upper side in the male." Bingham says it differs in being "darker brownish-purple suffused with plumbeous."

My specimens were almost all taken on one mile of cart road through this estate. Possibly a quantity from other districts might help in separating the forms, or in grading them even more perfectly.

Weather seems to have little to do with the variations, as the most extreme forms fly together. They can be taken all the year round at Haldummulla, but are easiest to capture in the wet months. The males settle on wet roads in abundance in April, May, October, and November. The females visit flowers, or settle on low bushes, showing a preference for bare projecting twigs. They flight in large numbers many times in the year.

A curious flight appeared for a day or two in September, 1915, viz., at the end of the dry season. The insects only measured 18-22 mm. in expanse, but in colour and markings were what I understand to be *plumbeomicans*. A dwarf variety of the white female (*prominens*) is not rare here, and I have received it from Ratnapura.

I have taken single specimens at Galle and Dambulla, but the group seems to be mainly confined to the hills, from 500 to 5,000 feet.

"Taken at Colombo" (F. M. Mackwood).

96. *NACADUBA ARDATES*, tailed form; *Nacaduba nora*, E.—Found in India, Malaya, and Australia.

97. *NACADUBA ARDATES*, tailless form; *Nacaduba noreia*, E.—Evans writes: "I believe with various other writers that *nora* and *noreia* are separate species; *nora*, the tailed form, is also yellow below."

Personally I am of opinion that the two forms are at least as fully entitled to rank as distinct as, say, *atrata* and *plumbeomicans*, but I agree with Bingham and De Nicéville in thinking that the tailless form does not answer at all to Felder's description of *noreia*, which I consider quite a distinct species. Apparently *nora* should stand for the tailed form and *ardates* for the tailless.

It is hard to define any difference between them, but the post discal pair of strigæ usually appear to be nearer the terminal margin in the tailless form, and sometimes even touch the sub-terminal markings. The bands enclosed by the strigæ also seem comparatively broader. I have never yet seen the variety of the female with the yellow under side without tails, and in both sexes the tailed form is the most variable in the ground colour of the under side.

They both fly together all the year round, but the males are most often seen when the roads are wet. In habits they resemble *atrata*, but both sexes seem particularly fond of the blossom of *acacia cæsia*, which is, I believe, also the food plant of the larvæ. The tailed form is far the commonest, though both are very abundant.

They both vary much in the markings on the under side, and specimens can be taken of both in which the basal strigæ fail to reach vein 1.

I have seen a few specimens in Galle, Colombo, Jaffna, Trincomalee, Anuradhapura, &c., but they seem commonest in the hills. Common at Ratnapura.

96. *NACADUBA NOREIA*.—This name is usually given to the tailless form of *ardates*, but both De Niceville and Bingham point out that this does not at all agree with Felder's description. The two main distinctions are :—

- (1) The external margin is less convex.
- (2) The basal strigæ on the under side of the fore wing do not extend below the median vein.

I have four males and two females which seem to answer this description. The males are a much brighter purple than *ardates*, and have a fairly broad purple-brown border. The females have a very bright blue patch on both wings, as bright on the lower wings as the upper; this I have never seen in *ardates*. In both sexes the fore wings are distinctly pointed, though not so much as in *viola*. The marginal spots on the lower wing of the female are obsolete, except in interspace 2, as Felder says; and the under side agrees with his description in every particular.

It is so rare that I do not care to express a decided opinion as to whether it is a distinct species, or merely a variety of *ardates*, but the few specimens I have seem to be quite as worthy of specific rank as *dana*, and I have seen no signs of gradation.

All my specimens are from the Haldummulla district. Felder described it from a specimen taken at Nuwara Eliya.

Since writing the above I have received 2 ♂♂ from Wellawaya and 2 ♀♀ from Kandy.

99. JAMIDES BOCHUS, M. & De N. ; *Lampides bochus*, B. & E.—Also found in India, Burma, Malaya, &c.

Varies a good deal in the width of the black border.

Bingham says that, measured on the dorsum of the male, this takes up one-fourth of the wing. In my specimens one-sixth is nearer the average. The female varies far more than the male in this respect.

It is exceedingly plentiful all over the southern half of the Island, and flies at Haldummulla all the year round. It occasionally flights in great numbers, and these flights are usually composed of dwarf specimens 22–25 mm. in expanse.

I have taken it from sea level to over 6,000 feet, and it seems to be equally plentiful in Galle and Nuwara Eliya. I have no notes of its occurrence in the north of the Island.

The male sometimes settles on wet roads, but prefers flowers.

“Caught in North-Central Province” (F. M. Mackwood).

100. LAMPIDES ELPIS.—Also in India and Malaya.

Common at Haldummulla, especially in March, April, and May. At times it becomes a pest in cardamom clearings.

The male varies little, and the female only in the width of the black border to the fore wing.

It is not given to settling on wet roads, but is usually found on bushes at the edge of jungle.

I found it very common near Galle in February and March, but have never seen it in the north of the Island.

101. LAMPIDES CORUSCANS.—Peculiar to Ceylon and very local.

The male varies little, but the female a great deal in the amount of blue on the upper side.

I used formerly to get this plentifully near Haldummulla, in a jungle which is now part of Mentenne rubber estate. Since this was cleared it has apparently disappeared from the district.

The specimens from there were rather smaller than those from wetter districts.

I have found it in fair numbers at Watering Point, Galle, in April, and it is common sometimes at Kottawa, and at Deniyaya. I have also specimens from Ratnapura.

"Found also in Kelani Valley and Dolosbage" (F. M. Mackwood).

102. *LAMPIDES LACTEATA*, B. & E.; *Lampides pseudelpis*, M.—Peculiar to Ceylon.

Bingham thought it might be "an occasional variation" of *L. elpis*.

The differences from *elpis* are very marked, and it shows no tendency to grade.

In the ♂ it is best distinguished by the absence of the sub-terminal row of black spots on the hind wing, and the much narrower terminal black border of the upper wing. In the ♀ the ground colour is much paler, and the basal half of the costa is blue, not black as in *elpis*; it is much more like the female *celeno* than *elpis*.

In both sexes the large spot in interspace 2 of the under side of the hind wing is very different, being larger and roughly pentagonal, instead of round, as in *elpis*.

It is not given to settling on wet roads.

Not common at Haldummulla, but may be taken in May, June, November, and December.

I have also taken it at Wellawaya and Monaragala, and have received specimens from Ratnapura and Deniyaya.

"Abundant at times in Lady Horton's Walk, Kandy, near the Pavilion" (F. M. Mackwood).

103. *LAMPIDES CELENO*, B. & E.; *Lampides ælianus*, M.—Also found in India, Malaya, China, &c.

The upper side varies very little. The under side varies in the ground colour and markings, but I cannot see that the variations depend on climate.

The male is often seen settled on wet roads, but both sexes are more frequently found on the bushes and grass by the road side.

The male has the same habit as *H. bolina* of taking up a position for days, and attacking every butterfly of about its own size that passes.

Exceedingly plentiful all the year round at Haldummulla, and I have taken it from Galle to Mannar, but it is commonest in the south. It is common in Nuwara Eliya.

104. *CATACHRYSOPS STRABO*.—Also found in India, Malaya, Australia, &c.

Very common in Ceylon, everywhere at low elevations, but becomes rare above 3,000 feet.

In his key to the genus *Catachrysops* (Bombay Nat. Hist. Journal, Vol. XXIII., p. 491), Bell gives, as the distinction between the species, the fact that *strabo* has "a dot on costa between discocellulars and post-discal band of spots." This dot is sometimes absent in Ceylon specimens of *strabo*, and I have a specimen of *cnejus* which shows it. In *strabo* and *lithargyria* the eyes are hairy, in *pandara* and *cnejus* they are smooth.

Not given to settling on wet roads, but both sexes fly low in open ground and settle on flowers, &c. It is especially plentiful in abandoned low-country paddy fields and chenas.

I have specimens from all over the low-country, from Galle to Jaffna, and the males show no marked variation dependent on climate, &c.; the females, however, vary in the amount of blue on the upper surface:—

105. *CATACHRYSOPS LITHARGYRIA*.—This is said to be found wherever *strabo* exists, but I believe that the only females known were caught in Ceylon. Bingham thinks it is only a variety of *strabo*, and says: "Nor has any corresponding difference been found among the females, while in the blue males the markings are precisely the same as those of typical males."

These remarks cannot possibly refer to Ceylon specimens. The ♂ differs not only in colour, but in the shape of the wings, and on the under side the markings are far broader, better defined, and an entirely different colour, the general appearance being very dissimilar. The female is much larger than any specimens of ♀ *strabo* I have seen, and the blue on the upper side is paler; the markings on the under side agree with those of the male, though lighter in colour, but are even broader. Moreover, it is apparently constant, and I have seen no signs of its grading into *strabo*.

The male may easily be mistaken for *L. celeno* on the wing, as the colour is the same, though paler.

It is very rare. I have taken one ♂ and three ♀ on this estate in the tea, and one ♂ settled on leopard's dung at Wellawaya.

"Captured at Puttalam, Lunugala, and Haragam, near Kandy" (F. M. Mackwood).

106. *CATACHRYSOPS ONEJUS*.—Also in India, China, Malaya, and Australia.

Rather a local fly. Very rare at Haldummulla, but is common in a few places in the low-country of Uva. Very plentiful in the Northern Province.

The males can be readily distinguished from the males of other species of *Catachrysops* in Ceylon by having on the upper side of the hind wing *two* nearly equal-sized black spots, one each in interspaces 1 and 2. The females have *both* these spots crowned with orange.

It is very variable in size, in the ground colour of the under side, and in the amount of blue on the upper side of the female. Var. *contracta* is apparently only a dwarf form and grades into *cnejus*.

In Southern India it is frequently a serious pest to the gram crops.

Localities: Hambantota, Wellawaya, Galgamuwa (North-Western Province), Anuradhapura, Jaffna, &c.

"Kandy and Colombo" (F. M. Mackwood).

107. *Catachrysops pandava*.—Also found in India, Malaya, &c. There are two very distinct forms of this in Ceylon, which apparently do not fly together, and might be separated as different races, if not species:—

(1) The large form, or true *pandava*. Average about 30 mm.

The male is a bright lavender-blue, with the veins very clearly marked. The fore wing with a brown terminal border over 1 mm. wide. Hind wing with a sub-terminal series of black spots, edged outwardly by a white line, the one in interspace 2 being sometimes inwardly bordered by red. Under side hind wing: sub-basal row of *four* black spots edged with white.

(2) The small form. Average about 20 mm.

The male is a rather dull violet-blue (almost matching *E. parrhasius* ♂), the markings of the veins very indistinct. The brown marginal border on the fore wing is extremely narrow, and the sub-terminal spots and white line on the hind wing are wanting, except in interspaces 1 and 2. Under side hind wing: sub-basal row of *three* black spots, of which the lower is often very indistinct.

The two females are very similar, but the smaller race have the blue on the upper side much darker, and on the under side show only *three* sub-basal spots instead of *four*. The eyes are smooth.

The large race is very common in the low-country of Uva, and is a very rare visitor to Haldummulla. I have not taken it above 3,000 feet.

The males settle in numbers on wet patches on the roads or on the sand in river beds, and have rather a quick flight if disturbed. They usually, however, settle again quickly. The females are much scarcer, and are most likely to be found on weeds in abandoned paddy fields or chenas.

The small form is apparently confined to the dry zone, and is extremely common in the Northern Province. Its habits are those of a *Zizera*, both sexes fluttering about together over short grass, and frequently settling on flowers. I have never seen the male on wet patches on the roads. It is especially plentiful at Elephant Pass (Jaffna) in December and January.

I have never yet found both forms in the same district. The small form occurs sparingly at Hambantota, so one might expect to find both near Tanamalwila, on the boundary of the Uva and Southern Provinces. So far I have failed to take either there. I have taken the large form at Trincomalee.

108. *TARUCUS THEOPHRASTUS*.—Also in North Africa, Socotra, Arabia, India, &c.

There are two varieties of the under side. In the first, all the black markings are very slender, and the post-discal band on both wings is a practically continuous slender line. In the second the markings are much broader, and sometimes rusty brown in colour. The post-discal band on the fore wing consists of six well-separated oblong spots; on the hind wing

of eight spots, of which the middle three or four are crescent-shaped. I have taken both forms together, and think they are only seasonal. They apparently grade into one another.

A very local fly, and apparently found only in the driest districts.

It is very abundant on the bund of Tissamaharama tank, and the sand dunes at Kirinda in the Hambantota District, in February and March. Also on the bund of Murunkan tank, near Mannar, in November. Fairly common at Kankesan-turai on the north coast, and at Fort Frederick, Trincomalee.

It flies slowly near the ground and frequently settles on flowers, so is very easy to capture.

109. *TARUCUS PLINIUS*, M., B., & E.; *Tarucus telicanus*, De N.—Also in Africa, India, Burma, Malaya, and Australia.

Very plentiful at Haldummulla, and I have taken it in every month but December. Its range extends from sea level to over 6,000 feet.

I have taken it at Jaffna, Mannar, Vavuniya, and Hambantota, but not in the wet zone.

The male frequently settles on wet roads, and when disturbed has a rather quick flight, and does not usually return. They are easiest to catch when flying round *Indigofera anil*, which is, I fancy, the food plant.

“Also on the seed pods of the white- and blue-flowered plumbago plant” (F. M. Mackwood).

110. *CASTALIUS ROSIMON*.—Also in India, Burma, Malaya, &c.

Very plentiful all over the low-country of Ceylon, but becomes rarer above 3,000 feet. It is commonest at Haldummulla in the dry season, June-August.

I have noticed it all over the low-country, from Galle to Jaffna. It prefers open country, and especially road sides; flies slowly, and is very easy to catch. It settles in numbers on wet patches on the roads.

It varies a great deal in the amount of black on the upper surface, but the variation does not seem to depend much on climate. Several of my lightest-marked specimens are from Galle (wet zone), and my two darkest are from Haldummulla (medium) and Jaffna (dry zone).

111. *CASTALIUS ETHION*.—Also in India, Burma, Malaya, &c.

Much more a jungle fly than the last, and is fond of settling on a twig or leaf projecting over a jungle path.

Is found nearly all the year round at Haldummulla, but is usually commonest in April and May.

It is common in the south of the Island, especially in the wetter districts, and I have taken it up to 5,000 feet elevation at Haputale. I have so far not taken it north of Dambulla.

112. *CASTALIUS DECIDEA*.—Also in India and Burma.

Moore also gives *C. hamatus*, but Bingham says this is only the wet season form. They certainly grade into one another.

In Ceylon the variation seems to depend very little on rainfall. Some of mine with an exceptionally narrow band (viz., *hamatus*) were taken here in the dry season, and some with the broadest band were taken from March to May, when there is a fair rainfall. Others are from Galle, which is in the wet zone.

It is a jungle fly, with habits like the last, except that it apparently flights at times.

It seldom settles on wet patches on the roads, like *rosimon*.

I have only taken it in the southern half of the Island, and never at any great elevation. It is very plentiful at times at Galle, and I have also taken it at Kegalla and Peradeniya.

113. *POLYOMMATUS BORTICUS*.—Europe, Asia, Africa, and Australia. It is said to have been taken in England, and is included in English lists as "the long-tailed blue."

One of the commonest butterflies. Is found everywhere, and is equally common in Galle, Jaffna, and Nuwara Eliya.

It varies very greatly in size, dwarf forms being very common. The female varies in the amount and shade of blue on the upper side.

114. *AMBLYPODIA ANITA*, De N. & E.; *Amblypodia darana* and *naradoides*, M.—Also found in India, Burma, Siam, and Borneo.

Moore says *darana* is larger than *naradoides*, the male being a darker blue and the marginal band narrower; the anal lobe is red only in the middle, its margin and the tail being black. The ♀ is uniformly brown above. I have not yet acquired

any specimens of males answering to this description. Moore says it is found at Kottawa. I have one ♂ from there, but it exactly matches all my other specimens, and I fancy *darana* is only a seasonal form. I have a specimen of the brown ♀ from Tangalla, and another with only a trace of blue from Haldummulla. By far the largest ♀ I have has a large blue patch.

Anita is very abundant in parts of the low-country of Uva. The best place I know for it is Wellawaya, where the males can often be seen in hundreds, settled on wet roads or any filth. If disturbed they only fly a short distance, and return very quickly. I have frequently covered half a dozen with one stroke of my net.

The female is exceedingly rare. I have taken two (on this estate) in twenty-seven years, and have seen one taken at Wellawaya. I have specimens from Tangalla and Kandy.

“Males abundant in the neighbourhood of Kandy; females very scarce” (F. M. Mackwood).

115. *IRAOTA TIMOLEON*, De N.; *Iraota mæcenæ*, M.; *Iraota timoleon nicevillei*, E.—Evans thinks the Ceylon specimens are a distinct race. *Timoleon* is found in India, China, and Malaya.

Very rare. I have taken a single specimen at Haldummulla in June, which appeared to be freshly hatched. I have three from Colombo.

I know nothing of its habits from actual observation.

“Feeds on the Banyan tree; emergence about March. Has been taken in the Knuckles district, and around Kandy” (F. M. Mackwood).

116. *SURENDRA DISCALIS*, M.; *Surendra quercetorum*, De N.; *Surendra quercetorum discalis*, E.—*Discalis* is smaller than *quercetorum*, which is found in India, Burma, and the Dutch Indies.

Formerly common at Haldummulla, but *Acacia cæsia*, its food plant, is apparently being killed out by *Lantana* here. I have also taken it at Wellawaya, Matara, Kegalla, Madampe, Dambulla, &c.

None of my specimens show any sign of variation, except in size. It generally settles on a bush at no great height, and if disturbed flies a short distance only, so is easy to catch.

Usually there are several specimens together, so if one is caught, an examination of the bushes near will probably lead to the capture of others.

117. *ARHOPALA PIRAMA*, De N.; *Nilasera pirama*, M.; *Arhopala centaurus pirama*, E.—Also found in Southern India.

Rare in Uva. I found it once in abundance at Obergoda, on the Muppane-Pottuvil road, in June, in the dry bed of a river. It only flew a short distance and settled on the bushes, so was easy to catch.

I have specimens caught at Kandy and Trincomalee in April.

"Taken at Colombo and Galle" (F. M. Mackwood).

118. *ARHOPALA AMANTES*, De N. & E.; *Nilasera amantes*, M.—Also found in India, Burma, the Andamans, &c.

It can at once be distinguished from the last by having a distinct lobe in the anal angle of the hind wing.

I have not yet taken it in Uva, but found it common near Galle, on nutmeg trees. If disturbed it almost always returns to the same tree at once, so is very easy to catch.

I have specimens from Colombo and Ratnapura.

"Plentiful around Kandy" (F. M. Mackwood).

118 A. *ARHOPALA*, nov. sp.—Last April I procured seven males and one female of an entirely new *Arhopala* in the forest between Kottawa and Udagama. I sent a specimen to the Indian Museum, Calcutta, for identification, and received the reply that "the species does not appear to be represented either in our general collection of butterflies, or in the De Niceville collection." It is therefore apparently new to the Indian region. When it is again safe to send parcels to England I hope to send one to the British Museum to be named.

119. *ARHOPALA ABSEUS*.—Also found in India, Burma, Malaya, &c. Not mentioned in Moore.

I have never taken this, but have specimens from Ratnapura given to me by Mr. Mackwood.

While fishing at Ambawela (6,000 feet) I saw a very small *Arhopala*. It settled close to me, and I think it must have been this species. Unfortunately I could not get my net in time.

"Has been taken in Colombo" (F. M. Mackwood).

119 A. There are two specimens in the Colombo Museum labelled *abseus* (Nos. 829 and 3,484), from Mr. Pole's collection. No localities are given. They are much larger than, and very distinct from, all the specimens of *abseus* from Ratnapura, and should be re-named.

120. CURETIS THETIS, B. & E.; *Curetis thetis*, M.—Also found in India, Indo-China, and Malaya.

Very common in the drier parts of the low-country. The male is very plentiful at Wellawaya, and is almost always found settled on wet roads and river beds. The female is scarce there. At Anuradhapura I have found the male scarce, but the female common. I have specimens from Elephant Pass (Jaffna), Mannar, Dambulla, &c., and have taken one on this estate (3,000 feet).

It is a most variable insect. I have two males, which correspond exactly to Bingham's description of var. *arcuata*, and there is a similar one in the Colombo Museum. My other males vary much in the shape of the wings and in the width of the black border on the fore wing; this border is almost always produced a short way up each vein of both wings.

The female usually has far less white than in Bingham's description and plate. In only one of my specimens does it reach to vein 1.

Bingham says, writing of the under side of the female: "In no specimen that I have seen is there any trace of the outer sub-terminal line of dark dots."

In three of my specimens these are far more distinct than in the males, and in all some of the spots are visible.

121. ZESIUS CHRYSOMALLUS.—Also in India.

A common low-country fly, but the male is not rare at Haldummulla, April to August.

I found it extremely abundant at Kegalla, both sexes being equally plentiful on the tea, October to February. It is not rare at Watering Point, Galle, Jaffna, and Mannar.

The male varies very little, but the female is most variable in the quantity and colour of the blue on the upper side. In some of my specimens it is reduced to a few blue scales at the base of the fore wing, while in others the wings are pale or dark blue, with a brown border.

I have found the pupa on the stem of an *Albizia moluccana*. The larvæ are always attended by the large red ant, and the perfect insect may be looked for wherever these ants' nests abound.

122. CAMENA DEVA, De N. & E.; *Pratapa deva*, M.—Found in India, Java, Philippines, &c.

A quite local insect. For very many years past I have always been able to find the males basking on one tree (*Ficus arnothiana*) on this estate, from April to November. The strong north-east wind entirely defoliates this tree in December, and the new leaves do not appear till the end of March, and the butterfly appears with the leaves.

The tree grows out of the side of a precipice, and requires a long-handled net to reach it. If disturbed, the males fly round and settle again, and never seem to go a dozen yards from the tree.

I have never seen a male anywhere except within twenty yards of this tree, and have never seen a female there. The ♂ *Z. chrysomallus* is fond of the same tree, but flies away very soon if disturbed. I have taken four females on the tea on this estate, and regard them as great rarities. The female can be at once distinguished from ♀ *T. longinus* by the absence of the post-discal band on the upper side of the hind wing.

I know of no other locality.

"Taken in Balangoda, Dolosbage, and Pundalu-oya" (F. M. Mackwood).

APHNÆUS.—This is quite the most difficult genus to name, and I confess that I am quite unable to hazard a decision as to how many species should appear in a Ceylon list.

The literature is unfortunately very limited. Moore's "Lepidoptera of Ceylon" only gives four species, viz., *schistacea*, *fusca*, *lazularia* (= *lohita*), and *ictis*. De Nicéville mentions a great number of species, but says that material is too limited to decide which should stand. Evans gives, from Ceylon, *schistacea*, *fusca*, *lohita*, *ictis*, and *ilacinus abnormis*. Species given by other writers are *greeni*, *minimus*, *nubilus*, and *zebrinus*.

Every species is variable, some very greatly so, and freaks seem to be common. There is also evidently a tendency, in

the ~~isole~~ group, to form small local races, so it is most important that all specimens be carefully labelled.

Something might be done by breeding, but the larvæ unfortunately require the attention of certain species of ants, so it is by no means a simple matter to breed them.

There are a very fine series in the Colombo Museum, but they require a lot of sorting.

123. *APHNÆUS LOHITA*, De N. & E.; *Aphnæus lazularia*, M.—Also found in India, Malaya, China, &c.

The largest Ceylon *Aphnæus* and the easiest to distinguish. It varies comparatively little on the upper side, but the colour of the under side varies greatly.

It is usually gregarious, and if one is found, a search near will probably put up others. It is very fond of the blossom of *Microglossa zeylanica*, in common with most other species of *Aphnæus*.

It used to be common at Haldummulla, but I have seen only one specimen there for many years. In February, 1916, it was very plentiful at Watering Point, Galle, and I have taken it at Hambantota, and have specimens from Ratnapura.

Its flight is very rapid, but it usually only goes a short distance and is easy to catch.

"Has been captured at Diyatalawa. Plentiful in southern parts of the Central Province up to 3,000 feet" (F. M. Mackwood).

124. *APHNÆUS FUSCA*, M. & De N.; *Aphnæus vulcanus fusca*, E.—Peculiar to Ceylon.

De Nicéville gave *vulcanus* as well, but Evans writes of Ceylon specimens: "The orange anal patch on hind wing below is not extended upwards along dorsal margin as in continental specimens," i.e., *vulcanus*.

The commonest *Aphnæus* in Ceylon. It varies greatly in the amount of orange on the fore wing, and in size. On the upper side of the hind wing the orange anal patch is sometimes continued nearly the entire length of the termen.

I have found it in the greatest abundance at Kankasanturai, on the north coast, in December and January. Very common at Elephant Pass and Giant's tank in the Northern Province, on the hill behind Haldummulla post office, at Hambantota,

and Tangalla. I have also taken it at Haputale, Kandy, &c., but not, so far, at Galle.

Its habits are the same as the last, and it is even easier to catch. At Kankasanturai I used the killing bottle instead of the net, as they were so difficult to disturb when feeding at flowers.

" Found generally north of Kandy, up to 1,500 feet elevation " (F. M. Mackwood).

125. *APHNÆUS MINIMUS*.—Given in Moore's " Lepidoptera Indica " as peculiar to Ceylon. Evans thinks it is a casual aberration of *A. fusca*. I do not think it can stand as distinct. I have found it with *fusca*, and it seems to grade. I think it is only a starved variety.

I have specimens from Haldummulla and Anuradhapura.

126. *APHNÆUS GREENI*.—Described from a single male captured at Pundalu-oya. Evans thinks it a casual aberration of *A. fusca*.

Considering how common freaks are in this genus, I do not see how a species can be established on a single specimen.

127. *APHNÆUS SCHISTACEA*.—Also found in India and Burma.

It is usually larger than *fusca*, and the males can be distinguished by the light blue iridescence on the lower wing. The females are usually still larger, but they seem to grade with *fusca*, and I am not always certain that I can separate them. It is extremely variable, as is usual with the genus.

It is common on a patana ridge near Haldummulla resthouse and at Haputale, and I have taken a few specimens at Kankasanturai, Elephant Pass, Trincomalee, Hambantota, and near Kurunegala.

128. *APHNÆUS IOTIS*.—Also found in India.

This is the most difficult species, or group of species, to name, and I can at present only treat it as a number of local races.

Bell, in " The Common Butterflies of the Plains of India," defines it as follows: " Fore wing upper side: brown, with a large triangular orange patch before apex, reaching the costa, markings of under side showing through as black spots and bands."

I know of no *Aphnæus* in *Ceylon* that has an orange patch reaching to the costa. In most Ceylon races of the *ictis* group the orange patch, if present, is very small and diffuse, the only one with a large clearly-defined patch being—

No. 1.—Very plentiful in the Northern Province.

♂.—Upper surface dark brown, with a variable, but usually well-defined, orange patch on fore wing; a patch of light blue scales along the dorsum: lower wing brilliant iridescent blue; anal patch usually pale red, with rather large diffuse black spots.

♀.—Ground colour slightly paler, orange patch much larger, occasionally occupying one-third of fore wing; dorsal portion of fore wing, and the whole of the hind wing, except anal patch, covered with pale gray-blue scales. In both sexes the marking of the under side appears on the orange patch with exceptional clearness.

Under side, both sexes: very pale gamboge-yellow with darker markings, occasionally varying into khaki or even, very rarely, pale reddish-brown.

The markings are always very clearly defined.

I have caught and examined some hundreds of these at Jaffna and Mannar, and, except for three abnormal specimens, they seem a fairly constant race or species. One freak is a ♂, upper side both wings pale reddish-brown, with slight blue iridescence on lower wing. No sign of an orange patch on fore wing.

Under side pale khaki-brown, the markings very indistinct, and broken up into more or less round spots with dark borders and silver centres. The other two are ♂ and ♀, only varying in entirely wanting the orange patch.

No. 2.—Somewhat resembles the last, but is darker; the orange patch is very small and very indistinct; the under side is reddish-brown *with well-defined markings*. I have a single specimen of No. 1 that nearly matches it on the under side, though very distinct above. This was very plentiful in the Hambantota district in July, but I did not succeed in catching a ♀. I have taken one ♂ at Haldummulla.

No. 3.—Very near No. 2 on the upper side, except that it is larger and the blue iridescence is carried well up into the upper wing, and the orange spot is sometimes absent.

The under side is reddish-brown. The markings are *very indistinct*, consisting of slender silver lines and a few black scales. Even the anal patch is merged into the rest of the ground colour, and the usual black spots are absent.

This is found on the Uva patanas at high elevations, but I have seen specimens from Badulla.

These are the only three races in my collection, but I think others could be picked out of the specimens in the Colombo Museum. Possibly No. 1 may prove to be an extreme dry season form of Nos. 2 and 3, but in general appearance it is very distinct.

129. *APHNÆUS NUBILUS*.—Is said to be distinguished from *A. ictis* by the absence of an orange spot on the fore wing of the male. If this were so, the majority of my specimens of what I have described as *A. ictis*—No. 3 race—are *nubilus*.

At Elephant Pass, in the Jaffna Peninsula, there is a common *Aphnæus* which is, I believe, true *nubilus*. It flies there with *A. ictis*, race No. 1, but I have, so far, found it nowhere else.

It is as widely distinct from *ictis*—No. 1—in appearance as any other *Aphnæus* in Ceylon, and I have so far seen no signs of grading.

♂.—Upper side : ground colour intense black, a dark blue iridescence covering the lower half of the fore wing and all the hind wing, except the anal patch, which is dark red. It strongly resembles *lohita* ♂, but the shape of the wings is different. Under side dark brick-red, with *clearly defined* markings ; anal lobe with two large black spots with a border above varying from yellowish to deep red.

♀.—Upper side : ground colour lighter than in the ♂ ; a small very diffuse orange spot on fore wing, the blue iridescence of the male being replaced by a slight dusting of pale blue scales. Under side as in ♂.

The very deep red of the under side is in striking contrast to the gamboge-yellow of *A. ictis*, No. 1, and they can be at once distinguished from one another, when settled, as far as they are visible.

130. *APHNÆUS LILACINUS ABNORMIS*.—Given by Evans as occurring in Southern India and Ceylon.

I do not know it at all, unless two specimens in the Colombo Museum should prove to be it. These specimens are ♂ and ♀, and were taken by the Museum collector at Illipakadavai, about twenty miles north-east of Mannar.

131. *TAJURIA LONGINUS*, M. & E.; *Tajuria cippus*, De N.—Also found in India, Burma, and Malaya.

It is often very common at Haldummulla, and I have taken it in every month but February. The larva feeds on *Loranthus*. Neglected orange and lime trees are always infested with this parasite, and a stone thrown into the top of the tree will often put up a number of the butterflies. They fly round rapidly, but soon settle again.

It evidently hatches out in the early morning, and requires a few hours before it is able to fly fast. If put up then, it will fly a few yards slowly and settle, and is very easy to capture in perfect condition.

It is equally plentiful in the Northern Province, and may either be beaten out of *Loranthus*-infested trees, or taken at flowers.

It varies little, except in size.

"All over the Island up to 1,500 feet" (F. M. Mackwood).

132. *TAJURIA JEHANA*.—Also found in India. Not mentioned by Moore.

It is apparently confined to the Northern Province, and the only place that I have seen it is between Kankasanturai and Kirimalei on the north coast in July, August, December, and January.

I found it plentiful on a hedge of *Todalia aculeata*, which was in blossom in December and January. I only captured a few, intending to take more later, but for the rest of my stay in the district the weather was so bad that I got no more.

It was in company with *T. longinus*, but was easily distinguished by the different gray of the under side.

In July, 1916, it was very plentiful in the same place, at tamarind blossom. The wind was, as usual at that time of year, very strong, and the butterflies kept to the sheltered side of the trees, and were easy to catch with a long-handled net.

133. *HYPOLYCÆNA NILGIRICA*, M. & De N.; *Chliaria nilgirica*, E.—Also found in Southern India.

An exceedingly rare fly. I have taken males at Wellawaya, settled on wet roads, in March, April, and November, and one female on this estate in February.

"A scarce fly, with extensive range. Has been caught at Matale (2,000 feet), Kandy, Puttalam, Jaffna, West Dolosbage, and Henaratgoda" (F. M. Mackwood).

134. *CHERITRA JAFFRA*, De N.; *Cheritra pseudojaffra*, M.; *Cheritra freja jaffra*, E.—Also found in Southern India. Evans says the Ceylon race only differs from *jaffra* in size.

Not rare in the low-country of Uva, but has a habit of settling too high for an ordinary net to reach. Generally several will be found together.

I have taken it at Wellawaya, Telulla, Tanamalwila, Kumbukkan, and Hambegama, in the low-country of Uva, and have specimens from Ratnapura.

It seems to vary very little, except in size.

"Found in heavy chenas around Kandy, Kurunegala, and in the Kelani Valley" (F. M. Mackwood).

135. *RATHINDA AMOR*.—Also found in India.

Found all over the Island, from sea level to 3,000 feet at least. Fairly common at Haldummulla. Plentiful at Galle and Jaffna.

Settles on bushes, and flies a very short distance if disturbed. Varies very little.

136. *HORAGA CINGALENSIS*, De N.; *Horaga ciniata*, M.; *Horaga onyx cingalensis*, E.—Peculiar to Ceylon.

Exceedingly rare. I have never seen a living specimen. I have one, given to me by Mr. Mackwood, caught at Kandy in September.

"Found at Kandy several months of the year. Very local and scarce. Latterly a few specimens taken near Ratnapura" (F. M. Mackwood).

137. *CATAPECILMA ELEGANS*.—Found in India, Burma, and Malaya.

When I first came to this estate in 1889, this butterfly was plentiful on one field of tea. An adjoining chena was then cleared, and it entirely disappeared, and I never saw another specimen till August, 1915, when I took a male near Haldummulla kaddies.

I have never come across it in my travels, so it must either be very rare or very local.

"Found around Kandy resting on stems of sunflower plants during the heat of the day. Has been taken in Maskeliya, Ratnapura, &c." (F. M. Mackwood).

138. *LOXURA ARCUATA*, M. & De N.; *Loxura atymnus arcuata*, E.—Peculiar to Ceylon.

Common at Haldummulla, and I have taken it in every month but February. Common at Galle, and I have specimens from Ratnapura and Madampe.

It varies very greatly in the shade of the ground colour, the amount of black on the lower wing, and the markings on the under side.

I have noticed that the colour fades a great deal if it is left too long in the killing bottle (cyanide).

Generally found fluttering along the edges of jungle or chenais, and is very easy to catch.

"Common in Central and North-Western Provinces to about 2,000 feet" (F. M. Mackwood).

139. *DEUDORIX EPIJARBAS*, M. & De N.; *Deudoryx epijarbas*, E.—Also found in India, Malaya, China, &c.

Common at Haldummulla, especially when fighting. There was a very large flight in August, 1915, travelling west, and small ones often arrive about December.

I noticed an exceptionally large flight at Pattipola in November, 1917.

I have also taken it at Galle, Hambantota, Jaffna, Mannar, Anuradhapura, and Ratnapura.

The male varies in the amount of red, especially on the lower wing. The female seems very constant.

Is fond of settling on the tea and on low bushes, but flies off very strongly if disturbed, and cannot be relied on to settle again quickly.

"Fond of the cultivated *Lantana* in gardens. Has been taken at Nuwara Eliya" (F. M. Mackwood).

140. *RAPALA SCHISTACEA*.—Found in India and Malaya. Not mentioned by Moore.

Usually very common at Haldummulla all the year round. I believe the larva feeds on tea blossom *inter alia*.

It is always to be found on tea which has run some time from pruning ; if disturbed it flies very rapidly round and settles quickly, generally on the same bush, so is easy to catch. It visits flowers freely, and seems especially fond of *Pointsettia*.

I have taken it at Anuradhapura, at the blossom of *Micasea scandens*, and also at Jaffna and Trincomalee.

“ Found in Central Province generally, up to 2,500 feet ” (F. M. Mackwood).

141. *RAPALA LAZULINA*, M. & De N. ; *Rapala varuna*, E.—Also in India.

Can be distinguished at once from the last, *R. schistacea*, by the much broader bands on the underside. The male has none of the brilliant blue iridescence on the upper side that *schistacea* has.

Very rare at Haldummulla, and it is many years since I caught one. Commoner at lower elevations in Uva. I have taken it in company with *R. schistacea*, at Anuradhapura, at the blossom of *Micasea scandens*. I have also specimens from Galle and Ratnapura.

“ Found from Galle to Anuradhapura, up to 3,000 feet ” (F. M. Mackwood).

142. *RAPALA LANKANA*, De N. & E. ; *Deudorix lankana*, M.—Also found in Southern India.

I have never taken this, and my only specimen was caught by a native dealer—he said “ at Colombo.”

It is found in the wettest district, viz., from Ratnapura to the Kottawa forest.

“ Caught near Ratnapura, March, May, October, and December ” (F. M. Mackwood).

143. *RAPALA MELAMPUS*.—Also in India, Burma, Dutch Indies, &c. Not mentioned by Moore.

I took one male at the blossom of *Todalia aculeata*, near Kankesanturai (Jaffna), in December. It is apparently confined to the Northern Province.

The upper side of the male is bright red, and the female dull brick-red, and they may easily be mistaken for *D. epijarbas*. In fact, I believed my only specimen was *epijarbas* when I first saw it in the net.

Mr. Fairlie took it at the blossom of tamarind trees in July, at Manipai, Jaffna.

144. BINDAHARA SUGRIVA, De N.; *Bindahara phocides*, M.; *Bindahara sugriva moorei*, E.—*B. sugriva* is found in Southern India, Java, Sumatra, &c. Sometimes common at Haldum-mulla.

The larva feeds inside the fruit of a creeper, called by the Sinhalese *Himbata* (*Salacea reticulata*). An examination of these fruits will often show the eggs, usually near the stalk, and a hole by which the larva has entered. Curiously enough there are almost invariably two or more eggs, but I have never found more than one larva in the fruit.

When fully fed it leaves the fruit, and evidently burrows into the bark of some tree. I had great difficulty in rearing them at first, as, if they could not burrow to pupate, they died. I then gave them a sheet of cabinet cork, and it seemed to be just what they wanted; the burrows were usually about one inch long.

Note.—Do not cut open the fruit to get the larvæ, or they will probably die.

My specimens show very little variation.

I have also taken it at Galle, Kegalla, and Kandy, and found it plentiful at the hot springs near Trincomalee in October.

“Very plentiful in the Matale district. Taken also around Ratnapura” (F. M. Mackwood).

145. VIRACHOLA ISOCRATES.—Also in India.

I have found this at Kirinda, in the Hambantota district, in February, at Elephant Pass (Jaffna) in December and January. And at Murunkan, near Mannar, in July, on the blossom of *Derris scandens*. The males are much less rare than the females.

“Low-country, generally where the pomegranate grows, as the larva feeds on its fruit” (F. M. Mackwood).

146. VIRACHOLA PERSE.—Also in India.

I took this, with the last, at Kirinda (near Hambantota), in February, and one female at Hambegama tank, in the low-country of Uva, in July, and have seen it caught at Wellawaya.

I have found it so rare that I know nothing of its habits.

“Similar range to the preceding, food plant being the same” (F. M. Mackwood).

(To be continued.)

APHIDIDÆ OF CEYLON.

By P. VAN DER GOOT. (Salatiga, Java.)

(With two Illustrations.)

UP to the present time but little has been recorded about the *Aphididæ* which occur in Ceylon. The most important Ceylon publication on this interesting group of insects is a paper by Mr. H. Schouteden, of Brussels, entitled "Notes on Ceylonese Aphides" ("Spolia Zeylanica," Vol. II., Part VIII., 1905, pages 181-189). This paper gives us a fairly good description of four Ceylonese plant lice, namely, *Greenidea artocarp*i, Westw., *Lachnus greeni*, Schout., *Oregma bambusæ*, Buckt., and *Ceratopemphigus zehntneri*, Schout.

Since then little or no further systematic work has been done on this group of insects in Ceylon. In the course of 1913 and 1914 a number of *Aphididæ*, collected by the late Mr. A. Rutherford, the Government Entomologist of Ceylon, were submitted to me for determination. Most of them were either well-known species, or had already been previously collected by me in Java; two of them appeared to be new to science. A list of the plant lice in this collection may, perhaps, be of some value in increasing our knowledge of Ceylonese insects; with the kind permission of Mr. Rutherford I therefore give a list of the plant lice observed, together with a description of the two new species.

List of Ceylon Aphididæ, collected by Mr. Rutherford.

<i>Macrosiphum, minutum</i> , nov. sp.	<i>Longiunguis spathodæ</i> , v.d.G.
<i>Macrosiphum rosæ</i> , L.	<i>Brachycaudus helichrysi</i> , Kalt.
<i>Micromyzus nigrum</i> , v.d.G.	<i>Greenidea artocarp</i> i, Westw.
<i>Toxoptera aurantii</i> , Boyer.	<i>Greenideoida ceyloniæ</i> , nov. sp.
<i>Toxoptera minuta</i> , v.d.G.	<i>Shivaphis celti</i> , Das.
<i>Aphis gossypii</i> , Glov.	<i>Oregma insularis</i> , v.d.G.
<i>Aphis tavaresi</i> , Del Guercio.	<i>Oregma minuta</i> , v.d.G.
<i>Aphis medicaginis</i> , Koch.	<i>Cerataphis lataneæ</i> , Boisd.

Notes on the above-mentioned Aphididæ.

Macrosiphum minutum, nov. sp.—

Apterous viviparous female.—Examples of some measurements :—

Length of body ..	2·34 mm.	Length of siphunculi	0·63 mm.
Breadth of body ..	1·17 mm.	Length of cauda ..	0·45 mm.
Length of antennæ ..	—		

Colour.—Body brownish. Eyes black. Antennæ yellowish-brown, darker towards the tip. Legs yellowish-white; the tarsi, the tip of the tibiæ, and the greater part of the femora blackish. Cornicles and cauda black. (Notes from specimen preserved in alcohol.)

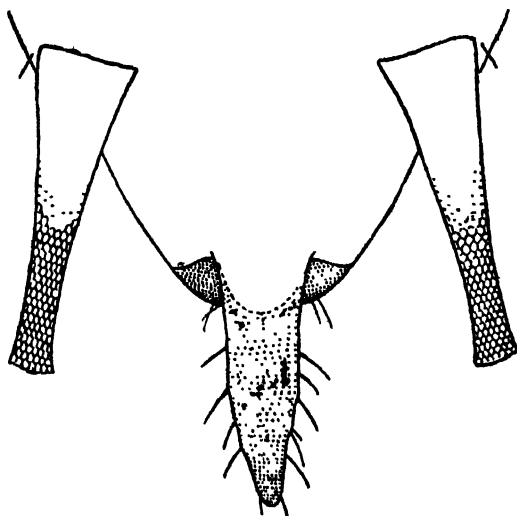


FIG. 1.—*Macrosiphum minutum*, n. sp.

HINDER PART OF ABDOMEN OF WINGLESS FEMALE (UPPER SIDE).

Morphological Characters.—Body ovate, the dorsum with transverse rows of spiny hairs, which do not arise from tubercles; the hairs are mostly slightly knobbed at the apex.

Antennæ partially broken off in all specimens examined, with a few stout spines. The third antennal joint bears only a single sensorium near its base. Frontal tubercles strongly developed.

Rostrum reaching to the third coxæ.

Siphunculi fairly long and thin, their basal half distinctly enlarged; the top part of the cornicles is finely reticulate. Cauda ensiform, about quarter shorter than the cornicles.

Legs long and slender, with scattered short spines.

Life History.—This small *Macrosiphum* was captured by Mr. Rutherford in May, 1914, living on *Vernonia cinerea*. Only a few wingless specimens could be discovered at that time.

Locality.—Peradeniya.

Macrosiphum rosæ, L.—Collected on roses, only wingless specimens present.

Locality.—Peradeniya.

Myeromyzus nigrum, v.d.G.*—A few winged and wingless individuals of this small species were collected by Mr. Rutherford on ferns (17-11-13); some months later (11-7-14) a single-winged female was observed on cinnamon (*Cinnamomum*, sp.). In Java only ferns have been observed as host plants.

Locality.—Peradeniya.

Toxoptera aurantii, Boyer.—The author's recent observations on this species have proved that *Toxoptera aurantii* has a very wide range of food plants. In Ceylon it has been collected by Mr. Rutherford on the following host plants: *Celtis cinnamomea* (on flowers), *Cynometra cauliflora* (on inflorescences), *Eugenia mooniana* (on apex of twigs), *Flacourtia ramontchi* (on young shoots), *Mesuaferrea* (on young twigs), and on *Plumbago capensis*. On *Mesua* the colonies were attended by the well-known ant *Ecophylla smaragdina*.

Locality.—Peradeniya.

Toxoptera minuta, v.d.G.—A single specimen was captured on the wing. In Java the author has observed a *Cyperacæ* (*Fimbristylis diphylla*) as a food-plant of this species.

Locality.—Peradeniya.

Aphis gossypii, Glov.—This widely spread and polyphagous species has been collected by Mr. Rutherford on *Aristolochia indica*, on an Euphorbiaceous weed, and on *Solanum torvum*. On the latter food-plant the colonies were attended by the red

* This and following species, bearing the author's name, are described in full in his recent publication on Javanese plant lice (Zur Kenntnis der Blattläuse Java's. Contributions à la faune des Indes néerlandaises. Vol. I., fasc. iii., 1915).

ant *Ecophylla smaragdina* ; though the infestation was heavy, only a single *Syrphid* larva was observed.

Locality.—Peradeniya.

Aphis tavaresi, Del Guercio.—Observed on *Citrus*, sp. only wingless specimens collected.

Locality.—Peradeniya.

Aphis medicaginis, Koch.—Collected on *Crotalaria striata* ; the colonies consisted chiefly of wingless individuals.

Locality.—Peradeniya.

Longiunguis spathodeæ, v.d.G.—A number of wingless and winged females of this species were collected by Mr. Rutherford on the shoots of *Panax*, sp. The colonies were exterminated by *Syrphid* larvæ and by an *Aphidius*, sp. This same species has been collected by the author in Java on *Gardenia florida*, *Senecio tenuifolia*, and *Spathodea diepenhorsti*.

Locality.—Peradeniya.

Brachycaudus heliochrysi, Kalt.—A few wingless specimens were collected by Mr. Rutherford on *Memecylon* [? *Memecylon*.—Ed.].

Locality.—Peradeniya.

Greenidea artocarpæ, Westw.—A number of apterous and alate females belonging to this species have been collected on the young shoots of the jak tree (*Artocarpus integrifolia*).

Locality.—Peradeniya.

Greenideoida ceylonæ, nov. sp.—

Apterous viviparous female.—Examples of some measurements of the body :—

Length of body ..	2.50 mm.	Length of siphunculi	2.16 mm.
Breadth of body ..	0.72 mm.	Length of cauda ..	—
Length of antennæ ..	2.70 mm.		

Colour.—Body pinkish-white (from notes by Mr. Rutherford on the living insect).

Morphological Characters.—Body elongate, slightly arched, nearly naked, except the margins of the body, which bear a few very short, slightly capitate hairs.

Antennæ about as long as the body, seven-jointed (the processus terminalis considered as a true joint); relative lengths of the last five joints about as 60, 23, 25, 18, 32. Primary sensoria apparently without hair fringe.

Rostrum slender, reaching to the third coxæ.

Siphunculi very long, not much shorter than the body, nearly cylindrical, with rather short hairs. Cauda nearly obsolete, obtuse. Rudimentary gonapophysæ 3, often indistinct.

Legs normally built, with a few short hairs.

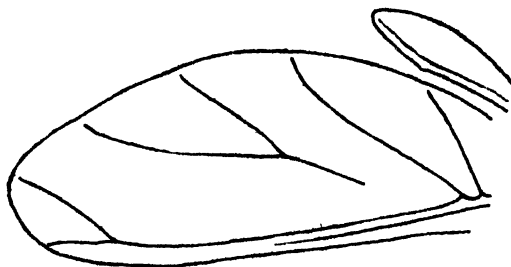


FIG. 2.—*Greenideoida ceylonæ*, n. sp.

FORE AND HIND WINGS OF ALATE FEMALE.

Alate viviparous female.—Examples of some measurements :

Length of body ..	2·35 mm.	Length of siphunculi	2·70 mm.
Breadth of body ..	0·72 mm.	Expanse of wings ..	7·90 mm.
Length of antennæ ..	—	Length of cauda ..	—

Colour.—Body brownish-black ; the sides of meso and meta-thorax, the base and the apex of the abdomen yellowish-brown. Venter yellowish-brown. Eyes crimson. Antennæ black. Legs dusky white. Cornicles black. Pterostigma of fore wings black.

(Notes on living insects by Mr. Rutherford.)

Morphological Characters.—Body elongate, nearly naked. Antennæ broken off in the specimens examined ; the third joint bears about 23 fairly large sensoria. The antennæ are placed on very small frontal tubercles.

Rostrum, siphunculi, and cauda as in the wingless form.

Wings hyaline, the fore wings with the pterostigma very long, extending to near the tip of the wing ; *sector radii* short and nearly straight, the *media I.* only once forked, the *media II.* somewhat curved. Hind wings very small, with only a single longitudinal vein. Hooking hairs 2 in number.

(Description from two specimens.)

Life History.—This interesting species was discovered by Mr. Rutherford on May 11, 1914, feeding on the young foliage of *Mesua ferrea*. Only a few winged individuals could be collected at that time.

The species is preyed on by *Syrphid* larvæ and parasitized by an *Aphidius*, spec.; the parasitized insects are black in colour and somewhat circular.

Locality.—Peradeniya.

Shivaphis celti, Das.—A number of winged females and a few wingless ones were observed by Mr. Rutherford on the under surface of leaves of *Celtis cinnamomea*. The insects are very conspicuous owing to their white waxy coating and the large amount of a yellowish liquid (honey-dew) which they secrete. The same species has been found by Mr. B. Das in the neighbourhood of Lahore (British India).

Locality.—Peradeniya.

Oregma insularis, v.d.G.—Of this species a number of wingless individuals were collected on the under surface of leaves of bamboo (*Dendrocalamus strictus*). The colonies were attended by *Ecophylla smaragdina*, the red ant. The same species is fairly common on bamboos in Java.

Locality.—Peradeniya.

Oregma minuta, v.d.G.—Some alate and apterous females of this species were observed on the under surface of leaves of *Dendrocalamus strictus*, where they were attended by small blackish ants (*Cremastogaster*, sp.).

Locality.—Peradeniya.

Cerataphis latanæ, Boisd.—A large number of apterous females were found on the inflorescences of an *Areca* palm.

Locality.—Peradeniya.

A NOTE ON LYMANTRIA AMPLA (Walker).

By R. SENIOR-WHITE, F.E.S.

(With a coloured Plate.)*

Position.—Order Lepidoptera, Heterocera. Family Lymantriidæ.

Distribution.—Throughout India, Burma, and Ceylon (Hampson).

Food Plants.—*Terminalia catappa* (De Niceville); *Ficus religiosa* (Lefroy): while in Ceylon I have found it on cacao, *Carissa carandas*, geranium, begonia, and rose. It appears to be extremely polyphagous, not one of the plants mentioned being even of the same natural order. The normal food plant in this district is probably cacao.

Occurrence.—There appear to be four broods a year, in January, April, June, and October.

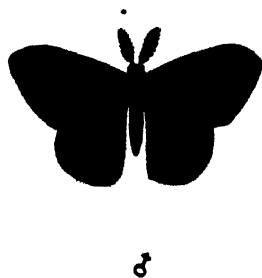
Egg.—Eggs are laid on the food plant in masses, which may measure as much as 25 mm. by 15 mm. by 12 mm., and which contain hundreds of eggs. The individual eggs are pinkish, over 1 mm. in diameter. The egg mass is covered with buff down from the body of the female moth.

Larva.—The hatching of an egg mass commences in about 11-12 days after laying, and continues irregularly for two or three days. The young larvæ make their first meal off the egg shell, and are at first 3 mm. long, buff in colour; but within twenty-four hours they darken to light brown, with a darker bar dorsally on abdominal segments 1-4 and 6-9, the ends of the bars being rounded off. As is usual with all Lymantriid larvæ, there are rings of small hair-bearing papules on each segment, and on either side of the head is an anteriorly directed hair pencil, but the large dorsal hair cushions on the leading abdominal segments so noticeable in other genera of the family are wanting.

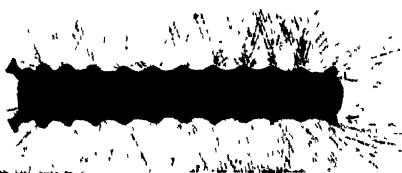
The appearance of the larva remains thus until a length of 15-20 mm. is attained. During this time there are probably two instars.

* This will appear in the next Part of *Spolia Zeylanica*.

LYMANTRIA AMPLA



Stage III



R. S-W. del.

This plate to face page 76 in Vol. XI., Part 40, of "Spolia Zeylanica."

In the second stage the colour is brown, darker dorsally throughout, with a bluish spot, faintly ringed with yellow, on each segment each side of the median line, while, in addition, on the sixth abdominal segment there is a median red spot ringed with black, and on the seventh abdominal segment a median black spot. The hairs are as in the first stage. This second stage lasts through only one instar. The maximum length attained is 30 mm.

Third Stage.—Colour coffee-brown. There is an inverted Y-mark on the clypeus. The junction of the pro- and meso-thorax bears dorsally a broad transverse dark velvety band, only visible when the segments are extended. There is a light median line on the three thoracic segments. On each segment is a dark brown hair-bearing papule each side of the median line, and on the meta-thorax and abdominal segments a similar but smaller pair of papules interior to and anterior of the larger pair. The larger outer papules are connected transversally across the segment by a dark line, which is complete on abdominal segments 4, 5, 6, and interrupted medianly on abdominal segments 2, 3, 7. On the three first-mentioned segments an inwardly directed dark line leads from in front of the larger hair papule to the anterior edge of the segment, but the lines from each side do not meet at the segmental edge. These lines are prominent only on segment 5 of the abdomen. On the sixth and seventh abdominal segments is a small dark reddish horn-like process on the median line. On the anal segment are three additional hair papules. The anteriorly directed hair pencils from the pro-thorax are prominent. There are the usual lower rows of hair papules, those at the lateral position being larger than the others. This is the last larval stage, and is of one instar duration only. The length full grown varies with the sex, the male larvæ attaining a length of 20-30 mm. only (this last being exceptional, and found only in the case of one larva, to be referred to later, which pupated in stage 2), while the female larvæ attain a length of 50 mm. with a corresponding increase in girth.

Varieties in Larvæ.—In one case I have found a larva, of normal appearance in stage 1, to appear in stage 2 with a

white subdorsal band, extending from the lower edge of the dark dorsal bar to the upper side of the sub-dorsal hair papules, which were thus strongly accentuated in appearance. The white bar was most marked on abdominal segments 1-4 and 7-8. In this larva the median spot on abdominal segment 7 was red. This larva pupated in stage 2, never assuming the appearance of the third stage, but the second stage was, as usual, confined to one instar. It gave rise to a normal male imago.

In another case I found a larva in stage 3 which possessed a broad white lateral suffusion from the meta-thorax to the anal segment. This larva gave rise to a normal female. It is thus apparent that the white bar is not indicative either of sex or of larvæ which pupate without assuming the appearance of the third stage.

Pupa.—In no case have I found a cocoon formed. The male pupa is 15 mm. long, chocolate-brown, slender. The wing cases are fully formed. The female pupa is 25 mm. long, ovate, with noticeably small wing cases. It is free, or attached to a twig by a few silk threads. The colour is similar to the male pupa. Pupæ of both sexes have tufts of short lighter hairs in rings on the abdominal segments, a few scattered tufts on the thoracic portion, and a collection of closely set small tufts around the head end. Both sexes have an obtuse anal spike.

Imago: Male.—Expanse 30 mm. Fore wings brown, lighter basally, across which portion are three ill-defined crenulated dark lines from costa to dorsum. The inner half of the costal margin is dark, but exterior to cell there is a whitish patch on costa, which may be very noticeable, or nearly uniform with the brown of the wing. The outer portion of the wing is dark, with a post-medial lunular line of darker brown, divided from the outer dark area by a lighter brown line of lunules. There is a dark spot in cell, and a dark lunule at the end of it. The median nervure is dark and prominent, especially from the sub-basal line to end of cell. The terminal cilia are yellowish at the extremity of each vein. The hind wings are a uniform somewhat lighter brown, but in one specimen (which originated from the above described larva

which pupated in stage 2) there were traces of post-medial and marginal dark lines. The body is small, slender, of a uniform brown. Antennæ plumose.

Imago: Female.—The female imago possesses only rudimentary white scale-like wings, which are functionless. The body is dark gray-black, pubescent. On emergence from the pupa the body length is 30 mm., being enormously distended with eggs, but as these are laid the length shrinks to only 10 mm. The legs are somewhat long, and enable the female to crawl a few inches from the pupa. Antennæ serrate.

Life Cycle.—Egg 11–12 days. Male: larva 27–32 days. Pupa 10–12 days. Total 48–56 days. Female: larva more than 55 days. Pupa 6–9 days. The total female life cycle thus occupies probably quite a month longer than that of the male. As the moths have no means of feeding, it is difficult to understand how the male moth exists until the female has emerged.

Oviposition.—On emergence from the pupa the female imago usually crawls a few inches and awaits the advent of the male. The female apparently produces a scent (though this is not noticeable to man), which reaches its strongest on the fourth day of imaginal life, when males are attracted in considerable numbers from some distance. In one case a female confined under a glass bowl from the time of emergence attracted five males into the laboratory from cacao quite 75 yards distant. The windows were shut at the time, but the males at length managed to gain entrance through a fanlight only some two feet square. The male is apparently dependent entirely on his scent organs to find the female, as on another occasion, when a male had entered the room and was fluttering round the table on which the female was confined in a glass, the latter was removed from the glass, the disturbance of the air in which apparently sent a wave of scent upwards, to which the male immediately flew, settling at the bottom of the glass, now empty, and ignoring the female herself, placed on the table within a few inches of him. He even had to pass her to enter the glass. The visits of the males to females in confinement always appear to take place about noon, and the males fly in the

brightest sunlight. At no other time have I seen the male flying by day.

An unvisited female appears to eagerly await the male, seeming uneasy, and continually raising the end of the abdomen and extruding the ovipositor. Copulation continues for about five hours, and fertilized egg laying commences about two hours later. If the male is not allowed access to the female, unfertilized egg laying may commence within a few hours of emergence, or be postponed for as much as two days. If the female has commenced to lay unfertilized eggs prior to copulation, eggs laid subsequently to this are still infertile. An unfertilized female can live ten days, but no eggs are laid after the sixth day until within a few hours of death, when a few separate white eggs, not covered with down, and removed from the main egg mass, are laid. Fertilized females do not lay such last few eggs, and die when oviposition is completed. The death of the male has not been observed.

Control.—The larvæ are parasitized by a hymenopterous fly, probably a chalcid, the grubs of which kill the larvæ at any stage, emerging from the dead body, pupating close by and emerging as imagines 9–10 days later. In common with other *Lymantriid* larvæ, the larvæ sometimes die of a kind of dysentery, very dark brown in colour, which appears to be caused by a diplococcus, which can be found freely in the discharge. Light has apparently no attraction for the males.

Status.—At present the insect can hardly be described as a pest, save of pot plants, geranium, and begonia, to which it is very partial. Its attacks on cacao are very slight, though I have no doubt that this is its main food plant in the Matale district, and much searching is necessary if larvæ are to be found. It is probably kept in check by the hymenopterous parasite. As, however, owing to obscure causes, the control over it of the latter may suddenly prove ineffectual, and a serious attack occur, the above notes are offered in the hope that they may prove of service in the event of such happening.

In conclusion, I have to thank Mr. G. M. Henry, Assistant Entomologist at Peradeniya, for confirming my identification of the insect.

NOTES.

Further Notes on the Wellawatta Horse.—In a recent publication of the Colombo Museum ("Spolia Zeylanica," Vol. X., Part 38) the writer (Mr. Wayland) attempted to establish a case in favour of the antiquity and specific distinctness of a couple of equine teeth discovered at Wellawatta. In the absence of type specimens and palæontological literature, it was not possible to compare the remains with any fossil species already described, excepting *Equus leptostylus*, Matsumoto (Science Reports, Tôhoku Imperial University, Japan, Second Series (Geology), Vol. III., No. I., pp. 29–30), but certain structural differences between the Wellawatta teeth and those of the modern domesticated horse (*Equus caballus*) were noted and described in detail. Moreover, it was shown that while the remains are younger than the oldest stone implements of Ceylon, they almost certainly antedate the historic period. Hikoshichiro Matsumoto, the Japanese Palæontologist, in a letter to the writer goes into the question of the possible affinities of the Wellawatta horse in some detail. After pointing out the more important features of the grinder (i.e., very simple plication of the enamel; the great width of the bay between the anterior and posterior inner pillars, and the concave inner side of the sub-triangular inner pillar), he shows that the Wellawatta horse exhibits likenesses to certain members of the Ass group (sub-genus *Asinus*). Next he gives some account of the following species: *E. sivalensis* and *E. namadicus* (upper Pliocene, India), *E. (Asinus) asinus* (upper Pleistocene, Europe and India), *E. hemionus* (upper Pleistocene, Europe and India), *E. hemionus* (upper Pleistocene, Europe and China, still living in Central Asia, Mongolia, and Siberia), *E. onager* (still existing in India), and an unnamed species described by Lydekker from the Karnul cave near Madras.

Matsumoto points out the resemblance between the Wellawatta molar and the corresponding teeth of *E. onager* and *E. hemionus*. He maintains it is not impossible that *E. hemionus* and the Wellawatta horse are co-specific, but does not, for zoographical reasons, regard this as a probability. He says in his covering letter: "I have observed the Wellawatta

horse* from the Palæontological side. I can safely regard that the Wellawatta horse [? molar] belongs to a certain horse not yet palæontologically named, though there is a possibility that it belongs to *Equus onager*."

In his summing up Matsumoto favours a correlation with Lydekker's unnamed species from the Karnul cave—a species which may, or may not, be closely allied to *E. onager*. He calls attention to the strong resemblance of a grinding tooth of the Karnul horse to the Wellawatta molar, and adds: "On the other hand, it may easily be expected that some members of the Karnul fauna haunted also in Ceylon. Thus, it is highly probable from the morphological and zoogeographical points of view that the Wellawatta and Karnul horses are co-specific. Thus, the specific name *E. zeylanicus*, Wayland, may be applicable to both horses, at least for the present, and until the supposed alliance of them with *E. onager* be actually proved. The following is a statement by Lydekker with regard to the antiquity of the Karnul remains:—

"The comparatively large number of species either totally extinct, or which are not now found living in India, renders it probable that the age of a considerable part of the Karnul cave deposits is not newer than the Pleistocene; and the fauna, as being almost certainly more recent than the Narbada beds, may be provisionally assigned to the latter part of that period."

Such an age corresponds well enough with the geological position of the Wellawatta teeth.

The following bibliography of the fossil horses of India is supplied by Matsumoto:—

(1) *Equus sivalensis*, Falconer and Cantley.

Falconer and Cantley: Fauna Antiqua Sivalensis, Pt. IX., 1849, Pls. LXXXI.-LXXXV.; Falconer: Palæontological Memoirs (edited by Charles Murchison), Pt. I., 1868, pp. 186 and 524; Lydekker: Palæontologia Indica, Ser. 10, Vol. II., Pt. 3, 1882, p. 87 (21); Lydekker: Brit. Mus., cat. Foss. Mam., Pt. III., 1886, p. 66; Lydekker: Rec. Geol. Surv. India, Vol. XXIV., 1891, p. 211; Schlosser: Abhandl. k. bayer. Akad. Wiss., II. Class, Bd. XXII., Abth. I., 1903, p. 86.

* From my drawings of the teeth; that is, Mr. Matsumoto has not had the advantage of handling the actual specimens.

(2) *Equus*, sp., aff. *namadicus*, Falconer and Cantley.

Lydekker : Palæontologia Indica, Ser. 10, Vol. II., Pt. 3, 1882, p. 88 (22), Pl. XIV., fig. I. (as *E. sivalensis*).

(3) *Equus namadicus*, Falconer and Cantley.

Falconer and Cantley : Fauna Antiqua Sivalensis, Pt. IX., 1849, Pls. LXXXI.-LXXXII. ; Falconer : Palæontological Memoirs (edited by Charles Murchison), Pt. I., 1868, pp. 186 and 525 ; Lydekker : Palæontologia Indica, Ser. 10, Vol. II., Pt. 3, 1882, p. 92 (26) ; Lydekker : Brit. Mus., cat. Foss. Mam., Pt. III., 1886, p. 71.

(4) *Equus (Asinus) zeylanicus*, Wayland. ? Cf. *onager* Brisson..

Lydekker : Palæontologia Indica, Ser. 10, Vol. IV., Pt. II., 1886, p. 39 (without specific determination) ; Wayland : Spolia Zeylanica, Vol. X., Pt. 38, 1916, p. 261.

(5) *Equus (Asinus) asinus*, Linne.

Lydekker, Palæontologia Indica, Ser. 10, Vol. IV., Pt. 2, 1886, p. 39.

E. J. WAYLAND.

On Colour Shades and Wing Markings of Euproctis semi-signata (Wlk.).—An egg mass of this moth bred out yielded thirty-nine imagines, in which the fore-wings were coloured and marked as follows :—

	Male.		Female.	
	White.	Yellow.	White.	Yellow.
Four spots on band cell to dorsum ..	—	3	—	—
Faint traces of such throughout ..	—	1	1	1
One spot below cell ..	—	1	—	1
One spot above vein 1 ..	1	2	—	—
Immaculate ..	4	5*	19†	—
* 53 per cent. † 86 per cent.	5	12	20	2

The “smoky black spot at end of cell” described by Hampson was only slightly developed on the left fore wing of one of the strongly marked males.

Five of the males had a dark brown patch on the posterior abdominal segments, absent from the rest of the series.

R. SENIOR-WHITE.

PROCEEDINGS OF THE CEYLON NATURAL
HISTORY SOCIETY.

Twenty-first General Meeting.

THE Twenty-first General Meeting of the Society was held in the Colombo Museum Library on November 16, 1917, at 5.15 P.M., the Rev. Father M. J. Le Goc in the Chair.

A paper entitled " Notes on Colombo Water Plants " was given by the Rev. P. T. Cash, and illustrated by many specimens.

In the absence of the contributors, Mr. W. A. Cave read the following papers :—

- (i.) Further notes on the Wellawatta Horse, by Mr. E. J. Wayland.

By Mr. G. M. Henry :—

- (ii.) Note on an albino Barbet (*Cyanops flavifrons*).
(iii.) Tameness of nesting Fantail Flycatcher (*Rhipidura albifrontata*).
(iv.) Land Leeches (*Hæmadipsa zeylanica*) attacking Snails (*Achatina fulica*).
(v.) Food of the Water Tortoise (*Nicoria trijuga*).

New Members :—G. H. Elliott ; R. A. Senior-White ; Dr. Gerald H. de Saram ; C. Ismail.

OUTLINES OF THE STONE AGES OF CEYLON.

By E. J. WAYLAND,

Late Assistant Mineral Surveyor to the Government of Ceylon.

(With nine Plates.)

I.—INTRODUCTION.

DURING the last five years much of my spare time has been spent in the investigation of the Stone Age remains of this country, and more particularly of those which occur in the lowland and coastal regions. I hoped to publish a detailed account of such discoveries as it was my lot to make when I had earned the right to do so ; and the end of this year would probably have seen the result had it not been for a more urgent call upon my time. The present outlines are sketchy and somewhat disconnected, but they must serve in the circumstances, as best they may, to indicate present results and possible lines of future investigation. My entire collection, with the exception of a few duplicates and hill specimens which have been given to other collectors, has been passed over to the Principal of the Royal College, who will select a representative series for the Colombo Museum. Unfortunately the most prolific sites for the older tools, of which my collection chiefly consists, are hidden away in far jungles, in places which are both costly and difficult to get at, and where too, the explorer must risk sickness and discomfort. It is unlikely, therefore, that the work which I drop so unwillingly will be at once taken up by others. There are few in this country so fortunately placed that they can in the course of their

official travels get well away from the beaten track ; but to those who travel at all opportunities to add something to our knowledge of early man must now and then occur. It is to such among you that these outlines are more particularly addressed. They will serve a useful purpose if they keep to stimulate an interest in the prehistoric antiquities of the Island, and thereby tend to foster future research. If they are no more than outlines, it is for reasons already told.

II.—VEDDAS AND THE STONE AGE.

The researches of Messrs. J. Pole, E. E. Green, Drs. F. and P. Sarasin, Dr. C. G. and B. Z. Seligmann, and Mr. C. Hartley have shown that in bygone days Ceylon was inhabited by a primitive people, whose weapons and tools were of stone, bone, and wood.

The want of representative types of artefacts has, till quite lately, rendered the culture stage (or stages) attained by these early folk a matter of some speculation ;* while, in the absence of definite geological evidence, nothing certain could be said of the age of such tools as were discovered. The vast majority of implements recorded by the above-mentioned authorities were found in the hill country, often on the surface, and seldom more than a foot below it. Their association with charcoal and presumably modern refuse and their occurrence in Vedda caves have led to the belief that the Veddas themselves or their immediate ancestors were the stone-age people of Ceylon.

* Drs. F. and P. Sarasin ("Spolia Zeylanica," Vol. IV., Part XVI., 1907, p. 189) say : "These stone chips are of a very rough kind, belonging to the older or Paleolithic Stone Age." And on p. 190 : "We, furthermore, may venture to say that the second main period of the Stone Age, the Neolithic one, . . . is entirely wanting in the Island of Ceylon." Dr. C. G. and B. Z. Seligmann say ("Spolia Zeylanica," Vol. V., Part XX., 1908, pp. 162 and 163) : "As regards the type of these quartz implements, there seems no good reason to consider them other than neolithic ; . . . many of the specimens differ in no respect from implements of the neolithic age found in Europe." James Parsons (*loc. cit.*, p. 190) remarks of one tool which was submitted to him that it closely resembles an eolith.

Misconceptions with regard to Vedda anthropology have fostered this view,* and the occasional discovery of bits of worked bottle-glass would appear corroborative.†

To the best of my belief, however, there is no evidence at all to show that people of Vedda blood passed through a stone-age phase in this country. Moreover, if, as seems highly probable, the wild forest people, so recently extinct in this Island, were the last survivals of the *Yakkas* of antiquity, one can hardly doubt that they (the Veddas) were a degenerate and not a primitive race.‡ The *Mahawansa* makes it plain that more than twenty centuries ago the *Yakkas* were highly civilized.

The fact that beneath the floors of Vedda caves stone tools are sometimes to be found throws little light upon their authorship; nor is the apparent newness of the tools themselves a telling argument in favour of modernity, since the crystal quartz, from which the vast majority were struck, is among the most imperishable of substances. Mr. Charles Hartley has shown that charcoal not uncommonly occurs in the "chip-layer" of the Bandarawela hills, and he takes this

* The late Professor Virchow, although a believer in the probable autochthony of the Veddas, shows in his monograph upon them (first published by the Royal Academy of Sciences of Berlin and afterwards translated—*Jour. C. B., R. A. S., Vol. IX., No. 33, 1886*) that anthropologically they are related to certain tribes of Southern India, and not to the Andamanese or to the aborigines of Australia, as some have thought. Churchward ("The Signs and Symbols of Primordial Man," London, 1913, p. 133) speaks unblushingly of "The Viddas of Ceylon—The race that the Ainu drove out and destroyed in Japan" Parker, writing with some authority on the Veddas, says ("Ancient Ceylon," London, 1909, p. 20): "Perhaps the strongest evidence of the country of their origin is their own tradition that this deity (a Hill God) came to Ceylon from Malawara-desa, 'the Country of the hill-region,' that is the Malayalam hills." If I remember rightly, even Huxley went amiss about the Veddas; to the best of my recollection he says in effect that the internal evidence of their language shows them to be related to the aborigines of Australia. (I cannot verify this statement, as the Colombo Museum Library has no copy of that remarkable work "Man's Place in Nature," and my own copy is in England.) The Vedda language, of course, is little known.

† I was much puzzled when, in August, 1912, I found at Haputale a fragment of a bottle which had obviously been worked to an edge. The explanation of this interesting specimen is probably to be found in a statement made by Mr. John Pole (Ceylon "Stone Implements," Calcutta, 1913, p. 3) to the effect that Tamil coolies working on estates in Ceylon, some thirty years ago, fashioned "rude glass razors" from the bases of beer bottles.

‡ See Chapter II. of Parker's "Ancient Ceylon," and in particular the last section of it "Evidence of Former Civilization" (pp. 103-112).

to indicate that the artefacts with which it is associated "are not of a very remote date, or otherwise the charcoal would have been absorbed and have left no trace behind." Again, I do not think this argument is valid, firstly, because charcoal is durable enough, and has been found on Roman and on stone-age sites of proved antiquity before; and secondly, because not everything in the "chip-layer" is of prehistoric date, as a recent find of brass cartridge sheets (by Mr. Hartley) conclusively proves.

If the Veddas made the stone tools of Ceylon, how is it that these people who lived, as we know they did, under conditions of extreme want and savagery, made no use of their art in the quest after a livelihood? Why should a people skilled in the manufacture of tools and weapons sufficient for their needs depend on barter with an alien race for precisely these implements?*

A wild hunting race, so long as it remains such, is not likely to forget the very rudiments of a craft upon which its life depends; but the weaker members of a civilized community, forced by the growing strength of class antipathy back into the wilderness, and divorced from the common arts of primitive folk by a thousand generations of specialized endeavour, may well be at a loss to cope with the conditions of a nomad's life. Such in effect, I believe, is the story of the Veddas. Like the Ascidians, who have forgotten how to swim, they have turned aside from the paths of progress and belied their heritage.

* The use of stone implements persists among a people long after their first acquaintance with metals. For example, flint implements, probably used for dressing monoliths, have been found at Stonehenge, and this structure is generally supposed to be a temple of the Bronze Age. In Egypt flint blades were used for eviscerating a body before embalment long after the discovery of metals. Obsidian knives were used by the priests of mediæval Mexico to hack out the vitals of their victims; and sharpened flint was used at Jewish circumcisions. The custom of placing flint blades in graves persisted as an ancient rite among the Frankish people of Gaul (whose sway over what is now north-west France came to an end in 752 A.D.); but the habit survived in Celtic folklore to a much later period. It is significant that Shakespeare makes the priest say at the burial of the unfortunate sister of *Læertes*—

. . . . "Her death was doubtful;
And, but that the great command o'ersways the order,
She should in ground unsanctified have lodg'd
Till the last trumpet; for charitable prayers,
Shards, flints, and pebbles should be thrown on her."

Out of tune with their environment, out of time with their era, they were doomed to extinction. The Veddas, we are told by those who knew them, did not laugh or sing, "but for amusement they would toss leaves in the air, in order to watch how these would flutter to the ground."* This is, indeed, a sad picture.

Man's innermost being is mirrored in nature, and so perhaps the Vedda saw (albeit subconsciously) little but his own sorry heart expressed in forest and dell, in the running waters, and the pleasant glades of Uva. And he must have known, if indeed he cared to know, that the days of his pilgrimage were few; that ere long he and his kind must pass away for ever. Perhaps he was glad of it, for to those who fall short in compliance with the demands of life there is a welcome in oblivion.

The brothers Sarasin say (*loc. cit.*) that the Veddas must represent the few remnants of the aborigines of the Island, who were met with by the Sinhalese on their first arrival, and were called by them *Yakkas*, according to the old tradition preserved in the *Mahawansa*. If this were true, *it is necessary to presume that these aborigines were living in the Stone Age at the time* (the italics are mine). Why should it be necessary to presume any such thing? That the Veddas and *Yakkas* were one is probable enough; but the authoritative statements of anthropology and history in so far as they prove anything at all go to show that the Veddas, as a race, have known better and kindlier days. Moreover, we are told by the same authorities that the Veddas were an older stone-age people, and, as I hope to show, the Paleolithic period in Ceylon takes us back many thousands of centuries, to a time when the geography of the land was different, and to days before the modern races of mankind had yet emerged. Twice on one page the brothers Sarasin find it expedient to insist that the autochthony of the Vedda "is a proved fact," and their evidence for this statement is the occurrence of stone tools under the floors of Vedda caves and in the soil of the patanas. I submit that the autochthony of the Veddas is not a proved fact, and further, that it is not even probable.

* Lewis, F. : "Notes on an Exploration in eastern Uva and southern Panama Pattu." (*Jour. C. B., R. A. S., Vol. XIII., No. 67, 1914, p. 285.*)

III.—THE STONE TOOLS OF THE HILLS.

Stone tools are now known to exist in enormous numbers in Ceylon. I divide them into two series : The Hill series and the Lowland series. This division is not a strictly natural one, but it is convenient. Previous authors have dealt chiefly with the Hill series. The artefacts found upon the highlands of the Kandyan Provinces are generally supposed to be of Neolithic date. They comprise scrapers (round, hollow, irregular, and straight), small blades, chisels, planes, arrow-heads, points and borers, flakes, cores and hammer-stones, &c. Large tools are conspicuous by their absence.

Nearly all of them are made from crystalline quartz, but occasionally one comes across a chert implement.* It is a curious fact that while chert tools are remarkably rare in the hills, flakes and broken fragments of this material occur in great abundance on certain sites. No doubt this fact is not without significance, but no one has yet ascertained its meaning.

Over and above these ordinary tools, Mr. C. Hartley has of late years discovered large numbers of highly specialized implements, which, on account of their small size and the fineness of their workmanship, are generally known as Pigmies. The term refers, of course, to the tools alone, and not to the people who made them.

This discovery is one of extreme interest and importance, for Pigmies are known to represent a particular culture-stage in the history of man, obtaining either at the close of the older (Paleolithic) or at the beginning of the newer (Neolithic) Stone Age. Authorities are inclined to differ on this point.

I need not detail to you the features of these implements, as they have already been figured and described in the pages of "*Spolia Zeylanica*."† Their uses are not certainly known,

* Mr. James Parsons, the late Principal Mineral Surveyor, in his paper on "The modes of occurrence of Quartz in Ceylon" ("*Spolia Zeylanica*," Vol. V., Part XX., 1908, pp. 171-177), gives an interesting account of the materials used by stone-age peoples of this country in the manufacture of their tools. Collectors should consult this.

† Hartley, C. : "On the occurrence of Pigmy Implements in Ceylon" ("*Spolia Zeylanica*," Vol. X., Part XXXVI., 1914, pp. 54-67).

but the fact that their distribution is practically world-wide* shows that they were designed to meet a very general demand ; and, if I might throw out a suggestion in passing, it is that the pigmy tools were used chiefly in the manufacture of bone needles, and that the so-called " back " was really the business edge. Mr. Hartley has called attention to the curiously limited number of types of artefacts in the Hill series ; he says : " Nothing resembling an axe has ever been found in Ceylon. There was, besides, no chopper or heavy blade, no spearhead, saw, punch, or fabricator . . . there were no sling stones or throwing discs, nor any sign of pot-boilers."† It should be remarked that this statement applies to the implements of the hill group only ; no information with regard to the tools of the lowlands was available at the time when Mr. Hartley's paper was written. These omissions cannot be without their meaning, but I for one am disinclined to throw in my lot with those who believe that the makers of the pigmies " maintained an inglorious existence by preying on the lesser creatures and trusting to flight from the more formidable."

It should be remembered that the tools of the Hill series have been collected almost exclusively from the tops of grass-covered knolls and ridges which protrude from the upland forests. There is no reason to believe that the natural conditions of this part of the country were essentially different in pigmy times ; indeed, the large accumulations of flakes and cores, indicative of " factory sites," show beyond reasonable doubt, that patanas existed in those far off days much as now.

There can be no question that the differentiation of crafts proceeds *pari passu* with the growth of civilization ; and, for my part, I believe this tendency to specialize expressed itself in very early times. One has only to see some of those excellent productions of the Solutrean period‡ to realize that the individuals who could express designs in flint with such extraordinary skill had advanced beyond the ordinary run of men. I believe that since the earliest times men have made

* England, France, Belgium, Spain, North Africa, Egypt, Palestine, East Africa, South Africa, India, Ceylon, and Australia are the countries from which pigmies have been recorded up to date. Doubtless they will be found in many more places yet.

† *Loc. cit.*, p. 64.

‡ See Appendix A.

two sets of implements : a common set to meet demands of immediate necessity, and another for more permanent use. The tools of the first were crude and made by any man, while those of the second were the work of few, who constructed them, no doubt, with not a little pride. They are the index of the culture-stage of the folk who made them, and, in some measure, a criterion of the mental status of the race.

The rise of industrial arts would naturally lead to the centralization of industries, with results akin to those which still obtain in some parts of Africa, where an entire village is devoted to the manufacture of spears and knives, another to wood-carving, &c. Nor is it perhaps too much to suppose that among a savage people skilled workers would be looked upon as a class apart at first escaping, and later on despising, common labour ; living by means of their craft alone and bartering their artefacts for the products of the chase.

If these, then, were the conditions of pigmy times, the larger implements adapted to the ordinary needs of life might well be missing from the patana sites. There on the open ground a colony of pigmy-makers, protected from intrusion, no doubt, by a palisade of stakes, could live at ease, quite unmolested by the big carnivores and other dangerous inhabitants of the wild. The meaner people would construct the palisade and build the huts with timbers hewn in the neighbouring forest. They would supply the pigmy-makers with meat and fruit and honey collected in the woods. All materials for the manufacture of the pigmy tools were brought up from the valleys, and as the industry was presumably special and more or less exclusive, the common tools were made, no doubt, in the valleys below, where the streams supplied large quantities of quartz.

I suggest this explanation of pigmy-factories merely as a working hypothesis. Further research will show whether it is acceptable or not, for the proof of its validity (or otherwise) lies in the jungles, the rice fields, and the wooded dells, which separate the patanas ; and these have never yet been searched.

There is one fact which, taken together with the general absence of common tools and weapons of offence, seems at first to militate against the hypothesis I offer. Mr. Hartley

states it thus : " In all cases where identical types of implements from above and below the surface can be compared, there is no question that the former is on the average considerably larger than the latter. The only marked exception is the large round scraper from the pigmy-layer alluded to. I have also picked up on the surface of Bungalow Hill a single arrowhead ; it is significant that this differs, not only in size, but in type from any recovered from below ground. I do not attempt at present to draw any hard and fast conclusion ; but the evidence before me inclines me now to believe that the two types are separated in time."* This may be so, of course, but it is well to remember that in soils subject to conditions such as those which affect the patanas, the larger pebbles and rock-fragments are situated at the tops, when they themselves are both chemically and physically stable, and are not derived from the strata underneath.

Microscopic examination shows that the soil-cap on the hill referred to is due to the weathering of the rocks below. The chip-layer is situated at a depth seldom less than two inches or more than six beneath the surface ; since, as can be shown, the soil-cap was not deposited over the chip-layer from an extraneous source, it follows that the chips must have sunk, as there can be no doubt that they were originally on the surface.

Worms, as far as my observations go, are decidedly rare on the patanas, so their participation as burying agents may be safely ignored ; burrowing insects, however, are more common. The latter carry out most of their work during the dry season, when a large percentage of the soil which they bring to the surface must be blown down the hill slopes. Consequently the chips descend chiefly by a process of undermining, and since small chips are more easily undermined than large ones, the tendency is for the larger fragments to lag behind in the downward movement. Moreover, large stones protruding from the soil are more easily dislodged from their positions by accidental circumstances, and are also less liable to be pressed into the soil by the feet of animals and men who may by chance trample on them.

* *Loc. cit.*, p. 66.

A difference in size of "identical types" from above and below the surface is not enough to establish an essential difference in age when the specimens are separated by only a few inches of soil; a consistent difference of type is what is wanted. I will not here enlarge on the question of surface and buried implements, though it is one of considerable interest. Nor will I deal further with the stone tools of the hills, for all else I can say under this head has been said by others before me, so I will pass on to speak of the prehistoric antiquities of the lowlands.

IV.—THE STONE TOOLS OF THE LOWLANDS.

The stone tools of the lowlands occur in detrital deposits or on the surface of such deposits, from which some of them are derived. These accumulations take the form of gravels terracing the river valleys and capping low hills composed of red earth which commonly overlies the gravels, of sand dunes, of the clays and loams of the rice flats, and the beds of modern streams. The features of these deposits will be described later.

The tools discovered include the forms described as belonging to the Hill series, together with another, and, I venture to think, older, assemblage, in which the types missing from the upland series are present.

Noticeable features of the lowland group, as a whole, are the prevalence therein of steep-sided scrapers or planes, the number of split and worked pebbles, the presence of domed, tortoise-like pieces, the size of the tools, and their composition.

On the average the lowland artefacts are very much larger than those of the Hill series. Small types occur, and these are generally composed of quartz either of the milky or crystal variety, while the bigger forms, more characteristic of the group to which they belong, were commonly struck from chert.

The chert varies in quality from an opaque splintery substance, little used by stone-age peoples, to a stone with a fine conchoidal fracture, closely resembling European flint, and often translucent in thin flakes.

In colour the newly cleft surfaces vary from almost black (rare) to white (also rare). The commonest colours are brown, greenish-brown (rarely distinctly green), various shades of buff, and an occasional gray. Brown chert, which is the commonest of all, is known to the Sinhalese as *ginigala* (fire-stone), and was in former days used by them, and also probably by the Portuguese, Dutch, and British, for gunflints. Dark red and pink shades are also to be found.

Comparatively pure chalcedony also occurs, while in the North-Central Province (basin of the Kal-arū) common opal, due to the replacement of limestone by silica, has been occasionally made use of by early man; but the material is too soft to have been much sought after.

The cherts are seldom homogeneous. The buff and brown varieties often contain strings and rosettes of a fibrous lighter-coloured silicious substance, in which the fibres are arranged at right angles to the length of the strings. Sometimes, too, the chert is brecciated or conglomeratic in structure, very rarely the latter.

Under the microscope many specimens show a marked development of spheroidal structures, due to the segregation of the purer silica around numerous centres. The more ferruginous material lies between the centric structures. Some cherts, more particularly those of Uva, exhibit a finely mottled appearance; and in these the microscope reveals a system of branching, butt-ended rods or tubes. These strongly recall organic structures. I believe, however, that they are nothing of the sort.

The origin of chert in Ceylon does not appear to be always the same. The mottled variety and that which contains the fibrous structures are formed, as far as my observations go, by the metasomatic replacement of gneissose and granulitic rocks by silica, a very curious and interesting phenomenon. Some grayish and brown cherts of the Northern Province appear to have been formed by a similar replacement of limestone. I say "appear" advisedly, for though I have never seen direct evidence of this replacement, I find it extremely difficult to account for the presence of the mineral otherwise. Some specimens from the extreme north of the Island bear

so astonishing a resemblance to European flint, that I was led at first to suppose that they had been imported (in the form of ballast) in the days of our forefathers for the purpose of making strike-a-lights or gunflints.

The occasional occurrence of a precisely similar material in the jungles of the Puttalam District, showing prehistoric workmanship proves this supposition unnecessary.

An extremely remarkable white laminated chert occurs interbedded with the metamorphic rocks of the lower part of the basin of the Moderagam river in the Northern and North-Western Provinces; while red and yellow jaspers of inferior quality are to be found near Pomparippu and in a few other districts. All these materials have been worked by prehistoric man.

Tools of milky and crystal quartz occur as they do, in the hills, while certain large implements were made from granular quartz rock (sometimes wrongly called quartzite). Tools of quartzite and volcanic glass resembling obsidian, like the materials themselves, are exceedingly rare, as are those of sandstone. Some bits of hæmatite appear to have been "nibbled" at and cast aside as useless. Once I came upon a pebble of white topaz which a stone-age man had attempted to flake under the impression that the material was quartz; his blows soon developed the perfect natural cleavage of the mineral and he cast the stone away. But that was in the hills.

Mr. Hartley records rounded pebbles of gneiss from hill sites. Personally I have never come across any tools composed of this material whether in the hills or lowlands.

How important a thing is silica in the history of man! * With no other substance could he have developed his skill so well, given a latent intelligence, two hands, and a chunk of flint, the rise of civilization is assured. Without the flint (or a closely allied substance) and the hands to work it, the most potent intelligence on earth would not have enabled man to rise above the status of a cunning beast.

* I suppose that 99 per cent. of the older stone tools of the world are composed of silica in one form or another. Quartz, jasper, chalcedony, opal, flint, and quartzite are chemically identical.

In order to indicate the several culture-stages represented by the lowland artefacts, it would be necessary to describe the various forms in detail and to draw comparisons between them and what may be called the standard types of Europe. This would be a lengthy procedure, and one which, to my great regret, I have not the time to carry out. It will have to be done one day, and when it is accomplished, I believe we shall see some striking parallels. Most interesting work it will prove, and it is not without considerable reluctance, and perhaps just a *souppçon* of jealousy, that I leave it to another. It is my hope that some future explorer will sooner or later be able to spare time to investigate the collection which I have made, and to publish his conclusions with regard to it. Here I will confine myself to general remarks. I may say at once that from all the best lowland stone-age sites artefacts of very different types may be recovered from the surface; the crudest tools may be seen rubbing shoulders, as it were, with Pigmies of the finest workmanship; and much-abraded artefacts with implements as sharp almost as in the days when they were made. Not only so, but flakes of new appearance may be gathered with others showing evidence of advanced decay. From these facts there is but one conclusion to be drawn, namely, the very obvious one, that manufactories have always been established near the source of raw material. In many parts of the Island gravels have afforded the one and only source.

Some day it will be shown, I think, that all of the several stone-age cultures of Ceylon were practised on the gravel sites. Meanwhile I will deal with a few outstanding features. One characteristic set of tools was made from pebbles (very generally quartz) of various sizes; these comprise scrapers, blades, axes, &c., so closely resembling some pre-paleolithic tools of England,* that a similarity of culture of their respective makers can hardly be denied. These I call *chipped pebbles*. Another series, possibly representing an advance, comprises flakes, trimmed and otherwise, which were detached from

* Reid Moir: "A Series of Pre-Paleolithic Implements from Darnsden, Suffolk" (Proc. Prehist. Soc. E. Anglica, Vol. II., Part II., 1916, pp. 210-213). The tools figured on Plates XLI. and XLIV. can be matched exactly from the Ceylon gravel sites.

pebbles by a smart blow delivered with a hammer-stone. The result of such a blow, of course, was to cleave from the pebble a segment having an oval outline, one flat, and one domed face. Such segments were, no doubt, used as knives, while trimming of the edge produced a scraper; these I call *split pebbles*, and since all these tools, whether of the chipped or split variety, are restricted in form by the stones from which they were made, I class them all together as the "Pebble group." There is another class of pebble tools which I regard as probably of later date.

These are widely distributed, but few and far between. They are small oval pebbles of crystal quartz, seldom more than an inch in length, which have been worked in such a manner that they resemble very tiny hand-axes of the Chellean period of Europe. They are delightful little tools, but I cannot tell what they were used for; and, as far as I know, they do not occur outside Ceylon.

The remaining artefacts are mostly unconditioned by the pebble outline. In passing we may note that pebbles of chert are by no means common, although this substance was extensively used by prehistoric man. Of angular fragments there is any number.

The Chellean phase seems to be represented by the usual hand-axe; but I have found few of these. The best example that I have came from the elevated ground to the east of Pomparippu; and one I found *in situ* at the base of the red earth near Marichehukkaddi. Scrapers of all sorts (hollow, round, straight, and irregular) are common. Side scrapers, the *râcloir* and "pointe," of Mousterian type occur, as do tea-cosy and prismatic tools. Pointed instruments with edge trimming, resembling that of the Aurignacian culture, and "hoof-shaped" pieces recalling those of Egypt* and Northfleet in England, are characteristic. Steep-faced scrapers or planes are very common, and Dolphin planes are to be found, columnar cores, conical cores, and throwing discs are fairly abundant. "Dosquabattu" knives and forms that I class as "peelers" are common. Beaked instruments are to be found.

* See "The Stone Age in Egypt," by W. M. Flinders Petrie ("Ancient Egypt," Part II., 1916, p. 68).

Picks (or perhaps I should call them gravers) made from large thick flakes and large rude digging tools are characteristic. Chopping instruments occur, of course, arrowheads (rare), (?) spearheads, points of various kinds, borers, and discarded bulb-ends are not uncommon. Flakes are to be found in enormous numbers accompanied by hammer-stones. Besides these, the ordinary Neoliths and Pigmies of the hills are not wanting.

A word about the peelers. These are worked on one face, and generally on one edge; the chipping is on a large scale, so that the worked edge appears more or less engrailed or coarsely toothed. I suppose that these were used in preparing spear- and arrow-shafts, or sticks for fish kraals and traps. Nor must I forget to mention bits of hæmatite ground flat on one or more faces. The flat faces are covered with scratches, which I take as evidence that these curious relics were used for the production of pigment.

Lastly, I may add that among the tools that I have mentioned, one occasionally comes across well-worn stones apparently chipped by man which recall the eoliths of Europe.*

There are other forms besides these, but for the present we must pass them by. I have merely mentioned the more important types as they presented themselves to my memory; but enough has been said to support my main contention, which is, that among the lowland implements we have an assemblage of distinctly paleolithic forms, and also a cruder and possibly older set. Added to these we have others resembling the neoliths of the hills. Circumstances have not permitted me to do much digging on the plateau sites, but I have several times recovered flakes *in situ* in the gravels, once a broken boring tool (?) (at Wellipatanwila), some crude pebble and eolithic forms (at Minihaḡalkanda and Kosḡala), and a net-like tool, already mentioned, from the base of the red earth near Mariochukkaddi. The examination of steep and crumbling talus-heaps, particularly those of Minihaḡalkanda in the Southern Province, leaves little room for doubt that the Paleolithic forms gathered therefrom were once *in situ* in the gravel.

* Besides these, there are some quite unworn tools of eolithic type certainly, in my opinion, chipped by man.

Before passing on to speak of the geology of the plateau deposits and their derivatives, I must say a word upon the much-discussed subject of patination. By patination is meant the surface changes affecting the colour and other physical characters of flint or chert. Crystal quartz is not liable to these, but may become frosted either by constant collision with other stones and particles of sand in motion, as in a river bed, or by long-continued exposure to the influence of the weather. In the former case the surface of the stone is generally covered with a meshwork of microscopic cracks ; in the latter, the surface resembles that of ground glass, but is infinitely finer.

Patination is a big subject, but I shall dismiss it briefly. Some chert tools acquire during the course of ages a deep almost black hue, others affect ochreous shades, and a good many of them turn white. Of these only I shall speak. Ceylon chert is an intermediate mixture of crystalline and colloid silica. The first is hardly soluble at all, the latter is more easily dissolved in alkaline solutions. Consequently the colloid particles are leached out during the course of centuries, and what remains is nothing but a spongy mass of tiny crystals which reflect the light, much as powdered chert would do, and make the stone look white.

The degree of rigidity of the spongy matter depends, of course, upon the ratio of the colloid to the crystalline material in the original chert and the proportion of the former removed. It would appear that the cherts of this country contain a high percentage of uncrystalline material, with the result that they are far less stable than European flint, which contains less. Indeed, not a few tools and flakes which I have collected are so " rotten " that one can scrape their surfaces with as much ease as one could a piece of chalk.

In certain circumstances fresh silica, drawn up probably from the as yet undecomposed chert below the surface of a tool by a process akin to inflorescence, is apparently deposited in crystalline continuity with the surface grains ; and, as a consequence of this, the tool presents a glazed exterior. The thin crust thus formed is tolerably resistant, and protects the " rotten " layer below, which is generally so porous, that it

will cling to the tip of the tongue more readily than will the broken stem of a new clay pipe.

The mottled cherts often display differential weathering, the mottling, by reason of its more resistant nature, standing out in bold relief from the remainder of the stone.

I am strongly disposed to believe that exposure to the weather is an essential factor in patination. I do not wish to be dogmatic on a subject which we have no time to pursue ; but I may add that I am inclined to think that patination never comes about without exposure. At any rate, I am convinced that no one who studies Ceylon stone artefacts impartially will place much reliance on degrees of similar patination as indices of age. That an artefact must be old to be patinated I have no doubt, but I do not think it follows that an old artefact must of necessity be patinated.

V.—THE GEOLOGY OF THE PLATEAU DEPOSITS AND THEIR DERIVATIVES.

In order to understand the history of early man in this country, it is necessary to pay some attention to the deposits in which such relics as he has left may yet be found. I have already briefly outlined these beds, and would not dwell further upon them were it not that the story they tell is one full of interest and significance.

The oldest accumulations with which we shall deal in this connection are what I have called the plateau deposits for reasons which will be presently apparent.

They are very widely distributed, and were, no doubt, at one time developed along the entire seaboard of the Island and covered much of the lowland regions. Since then, however, they have suffered denudation, and are now represented by detached and often widely separated outcrops.

The plateau deposits are generally venetian or brick-red in colour. They are liable, however, to be bleached from various causes, the growth of vegetation being one, when they present various shades of buff ; while some detrital beds derived directly from them are snow-white.

They consist typically of two strata ; the lower of these, though varying a good deal in composition in different areas,

belongs to that series of rubbly *débris* which the Public Works Department describes under the sometimes misleading name of gravel ; while the upper stratum consists of a red earth free of stony content. The whole series varies in thickness up to 50 feet or more.

The larger of the "gravel" fragments may consist of quartz in various stages of angularity and roundness, or of irregular concretionary bodies consisting chiefly of ferric oxide and angular sand. Every gradation exists between a good, well-rounded gravel, and a deposit in which the concretionary bodies are paramount.*

The quartz pebbles are seldom more than a few inches in length, while the longest axes of the concretionary bodies hardly ever exceed an inch. The matrix of the beds is a finely divided red material, which varies considerably in proportion to the mass, even within very limited areas. Pebbles of crystal quartz, when present, are generally corroded over their entire surfaces ; with milky quartz it is otherwise.

Boulders, sometimes weighing over a ton, occur locally.

All the pebbles are remarkably free from iron staining or any colouring matter, which cannot be removed with a scrubbing brush and a little water.

The gravel bed, as for the purposes of this paper I will call the lower of the plateau deposits, overlaps all the older rocks. It is to be seen sometimes resting on the archæan, sometimes on the older sedimentaries of the North-Western Province,† and sometimes on the various members of the Kudremalai (Kuthiraimalai) series.‡ It fills up the irregularities of the ancient surface below it. Nowhere does it overlie the alluvials of the rice fields, the coastal (or "reef") sandstone,§ or any

* Similar concretionary bodies are to be found in the beds of practically all streams which run dry in the rainless seasons.

† The Tabbowa beds. These have never been described, except in an official (unpublished) report on the district by the present writer.

‡ Though it has been necessary to make several references to these rocks in my official reports, no detailed description of them has yet been produced. It will suffice for the present to say that they are younger than the Tabbowa beds (older sedimentaries of the North-Western Province), and older than the high gravels which terrace the main river valleys.

§ For some account of this, see "*Equus zeylanicus*" ("*Spolia Zeylanica*," Vol. X., Part 38, 1916, p. 267).

deposit belonging to the modern era. The gravel bed is not always present, but whether this or the other member of the series, the red earth, directly overlies more ancient beds, the contrast in colour between the older rocks and the plateau deposits is striking, except when the former have suffered laterization. (See Appendix B.)

A typical plateau gravel in this country consists of a powdery deposit stuffed with stones, of which well-rounded pebbles are in the minority. It contains stone-age tools and flakes of both chert and quartz. The former, to judge by their surface appearances alone, are of every age from the newest to the oldest; the quartz flakes, too, give one a similar impression. It is evident that in this jumble of things, apparently ancient and apparently new, with a mixture of perfectly rounded and perfectly angular detritus in an earthy matrix, we have a deposit of no ordinary kind. These things are certain: it is not marine; it is not a common soil; it is not any ordinary accumulation at all. More than anything else it suggests a glacial till; but I may say at once that no theory of its origin founded on the presence of ice in this country can be entertained, for there is not the slightest evidence of past glaciation in Ceylon.

The apparent diversity in age of the contained artefacts is almost certainly deceptive, although it is probable that in the plateau gravels we have tools of more than one period. Among the specimens which I have obtained *in situ*, some highly frosted forms, recalling eoliths, and the occasional inclusion in plateau beds of masses of conglomerate, suggest an older deposit, from which the gravels have been in part derived.

The red earth which overlies the gravel is of simpler composition and justifies its name, in that it is best described as an earthy material of a brick (or venetian) red colour. It is remarkably free from stones or other foreign material, except very occasional flakes and artefacts.

I have examined a number of samples from various parts of the country, and I find that the following general description applies to all of them. They consist essentially of sand grains and very finely divided material, which is probably a mixture

of kaolin or china clay (with, perhaps, some aluminium hydrates) and iron oxides. The sand grains themselves are thickly coated with iron oxide, which often requires acid to remove it. The surface of the grains beneath this red coating are peculiar. Under the high power of the microscope, and by reflected light, they are seen to be polished and covered with the tiniest little pits imaginable. Moreover, sharp angles are generally wanting. The grains are all small, and seldom exceed one-sixteenth of an inch in diameter, while the majority are smaller. Most of the grains are quartz, but other minerals, such as spinel, zircon, ilmenite, &c., occur sparingly.

Rounded grains of quartz, like these, do not exist in the rocks from which they were certainly derived; so that, like pebbles, they must have acquired their roundness by a process of attrition.

If you examine the sand of rivers or of the sea, you will find that it is sharp. The reason for this is that the grains have been protected from excessive abrasion by the water, which acts as a cushion or fender between the solid particles.

In wind-blown sand, however, the grains are typically rounded, while the sand of most deserts includes a varying proportion of *millet seed*, or practically spherical particles. The reasons for these differences are given by Hatch thus:—

“Under wind action the rolling motion is predominant, while sliding is subordinate; secondly, when a sand grain moves in air, the whole weight is effective in producing friction, while in water only part comes into play.”*

So that while sand deposited by water is sharp, that blown by the wind is rounded. Another distinctive feature of sands is the presence or absence of mica. This mineral is nearly always present in aqueous sands, but practically never in wind-blown sands, though exceptional cases, of course, occur.

A certain proportion of millet seed grains is to be found in the red earth, while all the quartz particles are characteristically rounded. These facts taken together with the absence of mica point very decidedly to an æolian origin of the red earth; but there are difficulties. The wind in transporting material

* Hatch and Rastell: “The Petrology of the Sedimentary Rocks,” London, 1913, p. 54.

acts as a sorting agent, and separates lighter from heavier particles, so that in a wind-blown deposit we should expect to find an evenness of grain and an absence of pebbles. These two features are those of the red earth, but let us examine the matter more closely.

I find that the vast majority of particles in the red earth are less than one-sixteenth and more than one-sixtieth of an inch in longest diameter. A similar statement can be made with regard to recent blown sands in the north of the Island. These figures are by no means bound to hold good for all blown sands for obvious reasons ; but I have selected this example from the north for comparative purposes. Now, since the wind is selective, we may well expect to find some sort of rule with regard to the proportion of the different sized particles which it will shift, or has shifted. There will always be a certain amount of very fine material present in a blown sand ; let us examine that. The average of eighteen specimens (all of which conform in the general size of their constituent particles with those of the red earth) collected over a seaboard of some 30 miles in length shows that 1·114 per cent. of the material is less than one-ninetieth of an inch in diameter, while an average of sixteen samples of red earth from different districts shows that 4·52 per cent. of its bulk is equally small. This is a very big difference, and this last figure is too low, for it only expresses the proportion of fine material (less than one-ninetieth of an inch in diameter), which is easily separated by means of a sieve. It says nothing of the quantity of snuff-like dust which clings to the larger particles.

If the first figure then is of any use for comparative purposes, the red earth is either not a wind-blown deposit, or it is a very abnormal one.

If you take a handful of dry red earth and sprinkle it in fair quantities before the breeze, you will find that the wind separates, more or less, the fine material from the coarse as it falls ; this argues badly for the æolian origin of the red earth.

But in this connection there is one significant point to be noticed.

All the larger grains are composed of chemically stable materials, the vast majority being quartz. Now the ordinary

river or sea sand is differently constituted, for, in addition to quartz, a large number of other minerals are present. Among these felspar is conspicuous.

Felspar gradually decomposes under the influence of meteoric waters; and one of the chief products of this breakdown is kaolin (china clay), which takes the form of exceedingly minute flakes. But felspar is not by any means the only other mineral besides quartz, which is to be found in sands derived, as those of Ceylon are, from igneous and metamorphic rocks. There are, besides, ferromagnesian silicates and iron ores, all of which are unstable. These decompose in time under the influence of rain water just as felspar does.

In the light of these facts, therefore, we may interpret the red earth. In my opinion the red earth is a wind-borne deposit, of which the constituent grains were those of the crystalline rocks from which the particles were derived. In the course of time the unstable minerals have decomposed, thereby giving rise to the usual decomposition products, of which finely divided kaolin and hydrated iron oxide are the two most prominent. Thus can we account for the peculiar features of the red earth.

I may say that certain deposits of white sand in the Western Province can be shown to be derived directly from the red earth. All the fine earthy material has been removed from it by natural causes, so that now it consists of over 99 per cent. of quartz sand. I find on estimation of sixteen samples that on the average 1.225 per cent. of the material is below one-ninetieth of an inch in diameter, a figure sufficiently close to that obtained from modern dunes to corroborate our conclusion drawn from other facts. The wide occurrence of red earth points to the past existence of enormous stretches of blown sand, in fact to desert-like conditions over much of the low-country.

Such, then, are the plateau deposits; now for their distribution.

In the course of coast surveys I have traversed on foot the entire coast between Kumane in the south-east and Point Pedro in the north *via* Galle, Colombo, and Mannar; and from Point Pedro to the mouth of lagoon immediately above

Mullaittivu, a total distance of over 850 miles, most of which I have covered more than once. Besides this, I have travelled and made observations in all the Provinces of Ceylon, except the Eastern. From what I have learnt from those who know the Eastern Province, I gather that plateau deposits are represented there; certainly they occur in all the others, and everywhere their features are much the same.

A complete list of all the places in which I have found these remarkable beds would not only be tiresome, but also out of place in a general paper such as this.

The following is an account of the more interesting localities in which plateau deposits occur.

Starting from the Kumbukkan river and working eastwards to Hambantota one comes upon a number of plateau outcrops, and a still greater number of plateau deposits which have been reconstructed at lower levels. The best exposures are to be seen between Uda Potana and Yala, where there are several outcrops of exceptional interest. The best, perhaps, is at Minihagalkanda.

Here an ancient plane of marine denudation, once of crystalline rock, but now highly kaolinized, supports sedimentary strata, which in their turn are covered by plateau beds. The site is highly implementiferous, and is, perhaps, the most geologically interesting of all plateau sites that I have seen. Between Minihagalkanda and the lowland hills, situated several miles inland, are reconstructed plateau gravels and other deposits of newer formation than the red earth, while here and there one can trace the remains of gravels still *in situ* around the hills.

Travelling towards Hambantota one sees occasional plateau outcrops, and quite a number of implementiferous deposits of younger date. I am inclined to think, though I have not sufficient evidence to prove the supposition, that the reconstructed gravels and other beds formed after the denudation of the red earth are more or less contemporaneous with the Pigmies and (?) Neolithic tools with which they are associated, and younger than the larger types which are found in the same beds, which artefacts, I suppose, were derived from the older gravels.

Beyond Hambantota gravels occur. These yield a certain number of implements. Exposures are best seen between Ranna and the coast.

Wellipatanwila affords some interesting sections ; and there implements are fairly plentiful. Several gravels capping low hills between Hambantota and Tangalla are exposed in road cuttings.

Outcrops between Tangalla and Colombo are, as far as my knowledge of the country goes, not particularly good. They are to be seen, however, between Matara and Galle—the Kamburupitiya resthouse is built on them—and in patches between Galle and the Capital.

North of Colombo outcrops are more plentiful. Numerous between Negombo and Chilaw. They are, however, small, and seldom afford anything but the crudest artefacts.

Between Chilaw and Puttalam plateau gravels are fairly common, and artefacts rather more plentiful.

In the Puttalam District many may be gathered. Outcrops along the main roads to Anuradhapura and Kurunegala are not without interest ; but the best occurrences are to be found to the north of Puttalam. A fairly good section is to be seen to the south of Karativu, but the implements are poor.

The coast road from Puttalam to Mannar is easily followed to Vannathivillu, a distance of 12 miles ; beyond that it is nothing but a jungle track to beyond Arippe ; but implement-bearing gravels along it are worth investigating. The best sites along the track are (1) 4 miles beyond Vannathivillu, and (2) a mile south of Marichchukkaddi.

If one turns aside from the tract, however, and goes into the Puttalam Game Sanctuary, more interesting discoveries may be made. In order to do this, one must be prepared to “rough it.”

Nothing but a bullock cart can be taken beyond Vannathivillu, and that only with difficulty. The collector must make his way to Pomparippu, and thence into the sanctuary,* as far as Kokkarevillu. Beyond this his only means of transport is a gang of coolies. In the sanctuary, of course, nothing can

* Permission must first be obtained to enter the sanctuary.

be shot, and all supplies both for the collector and his men must be carried, as well as a tent, that is if he wants a tent ; personally I have managed without, but I cannot recommend this mode of travelling to anybody who cares for comfort. From Kokkarevillu he must travel northwards and eastwards to a point some 12 miles from the mouth of the Moderagam river (marked on the map with a cross) and establish his camp. Once across the river one is beyond the limits of the sanctuary, and may shoot for the pot, but there are no villages here, so nothing can be bought.*

This spot is a perfect paradise for the Prehistoric-archæologist, and is the most productive that I know. Here the plateau beds are dissected by a number of streams and exposed over a wide area. Stone tools of all descriptions, from the earliest to the latest, may be gathered here ; and to anybody who will spend a week or so collecting interesting discoveries are assured. There are, too, several relics of ancient Sinhalese civilization in the vicinity.

Another good site for the collector lies near Pomparippu.

Looking eastwards from the village one sees two ridge-like elevations (really turtle backs).

The further of these, some 3 miles away, is well worthy of investigation. It was from there that I obtained my first Ceylon example of an early stone-age hand-axe.

Several sites in the North-Central Province are worthy of a visit. One of the best is Kumpudumalai ; another prolific locality is the source of the Kunji-arū ; but these again are difficult of access.

Though a number of sites from the Moderagam river to Mannar and northwards might be mentioned, none to my knowledge yield many relics. The same remark applies to the Jaffna peninsula and to the country between Point Pedro and Mullaittivu.

* A word of notice to the intending traveller. Do not pay too much attention to the maps of the jungle parts of the Puttalam District. They are often inaccurate and liable to lead one astray. The best plan is to take a native who knows the country, if one can be found, and let him act as guide. There are several men in Puttalam at the present time who were members of my caravan.

The two best sites that I am aware of are (1) Minihagalkanda in the Yala Game Sanctuary, and (2) the point marked with a cross on the map in the Puttalam Game Sanctuary. These, like all the best plateau sites, are situated in unopened country; and in order to work them, the collector must exchange the artificial comforts of the town for the rough and ready ways of the wild.

The red earth country has a geography of its own. It is essentially low-lying, with large low domes generally less than 100 feet in altitude above sea level and 2 or 3 miles in length by, perhaps, $1\frac{1}{2}$ in width. From the plain they resemble low ridges, but are best described as "turtle backs." They are covered with red earth, but the flats between them are of varying composition, and, are younger than the red earth. The whole supports dense jungle or cultivation. This curious undulating country is at first extremely difficult to account for, since the red earth is a soft deposit, and not likely to offer much resistance to denudation. Nor are matters simplified by the occurrence of pools which have no outlet or streams to feed them,* and the fact that all the turtle backs appear to have a core of older rocks. At first sight it looks almost like a case of folding. The older rocks of Ceylon have been bent and folded to a remarkable degree by secular movements. That these are exceedingly old there can be no doubt, inasmuch as all the bold features of our mountain scenery have all been produced by denudation since the ancient crystalline rocks were twisted and crumpled. The movements were due to certain tangential stresses set up in the earth's crust, and acting for the most part in approximately east and west directions, so that the major folds run across the country more or less at right angle to them. Now the long axes of the red earth domes also follow this direction, but evidence of folding in the plateau beds is generally wanting. It would not be surprising to find that beds newer than the ancient crystalline rocks, and separated from them by a tremendous lapse of time, had been folded too, for the axis of a fold is a line of weakness, and earth movements often re-assert

* Most of these *villages*, as they are called, dry up in the rainless season.

themselves after a considerable interval. Now at Kudremalai the red earth is bent over an anticline of sedimentary rocks, while plateau beds at Minihagalkanda have suffered in a somewhat similar way ; but evidence, so far as I have been able to gather it, does not allow one to apply these facts to the explanation of the earth domes in general. Indeed, folded plateau beds seems to be the exception, not the rule. Owing to the density of the vegetation and the thick mantle of red earth, and also to the accumulations of detrital matter derived from the red earth which flank the domes, the internal structure of these features is generally difficult to observe. Small streams, however, sometimes afford interesting sections ; and from them one gathers that the structure of what I shall call the typical red earth dome is as follows.

The central core is a mass of ancient rock ; over and around this is a layer of sedimentary material. Above the whole are the plateau deposits.

There can be no doubt whatever that the cores are the remains of ancient turtle backs which once ran in lines across the country. They are not in themselves folds, but a product of past differential weathering. What is the probable history of these remarkable elevations ? I think it is this. We start from the fact that gravel is deposited in water, and water shows a preference for valleys, not for hills. Now the plateau beds can be traced from one elevation to another, but they are missing in the valleys between ; and so we must infer that the valleys have been produced since the plateau beds were deposited. All this is plain sailing, but we have to account for the curious persistence of the hills. When the plateau gravels were left dry, they must have formed a vast plain, and in places, such as the north of the Island, where there are no permanent rivers (and where, by the way, the domes are best developed), there was no *a priori* reason why valleys should have been produced on particular sites ; and apparently none whatever why denudations should choose to carve out hills exactly where it had done so before. Manifestly then the cause must be, so to speak, an internal one ; and since secular movement cannot be invoked, the cause must somehow lie in the buried hills themselves. Now the

plateau beds are extremely pervious to water. The sedimentary beds, though less so,* are infinitely more pervious than the crystalline rocks. Consequently rain water which passes freely downwards through the plateau deposits soaks through the sedimentary beds and tends to collect upon the rocks below, making its way down the slopes of the ancient turtle backs to the bottom of the buried valleys. Somewhere along the main line of flow the surface of the country is bound to cut the water table, for meanwhile subaerial denudation will have been at work ploughing runnels and small streams in the plains, or, failing that, the water table, kept up by the beds below, will be cut at the coasts if the country has been elevated at all. And so a spring starts. The gradual crumbling in the beds above the source of the spring opens the way for a surface water-course, and thereby to external drainage on ancient lines. Thus the general features of the buried landscape are reproduced.

But superimposed upon this persistent geography are the remains of that of red earth days ; that is to say, of a desert geography ; and just as water tends to accumulate between the hollows of the sand hills of the Jaffna peninsula, so, no doubt, it did among the dunes of red earth times. Thus, I think, are the *villus*, those curious ponds unfed by streams and provided with no outlets, of which I have spoken before, to be explained. Nearly two years ago Mr. H.F. Tomalin, the present Conservator of Forests, suggested to me that *villus* owe their origin to the action of the wind. I now see that his suggestion was probably much nearer the truth than I was at that time disposed to think. The fact that *villus* really are ancient features is rendered probable by the occurrence of stone tools on more recent sand dunes, which sometimes flank them on the north-east sides. The sand of these dunes is white ; it was derived from the red earth and bleached by the hygrophytic vegetation on the edges of the water before it was blown into its present position. The stone tools cannot have been blown up as well ; and, as we have seen, they are probably

* See my remarks on this subject in "Spolia Zeylanica," Vol. X., Part 37, pp. 168-174.

of ancient manufacture. Presumably these white sand heaps belong to Neolithic days. They do not seem to be encroaching much upon the jungle now.

Ancient red earth dunes are to be found buried beneath those of more modern dates and lighter colour in the Jaffna peninsula. From some of the former, at Kalmunai, I have gathered quartz flakes.

Denudation has accomplished so much since the red earth was laid down that the present outcrops are mere scattered remnants. One traces them over the lowlands and up the valleys of the permanent rivers.* And here I would call attention to the difference between permanent rivers, such as the Kelani and the Kalu-ganga, for example, with their buried bottoms and ancient history, and the modern streams which have no such buried bottoms. The latter have all been formed since red earth times, and the great majority (though not all, I should suppose) rise in the low-country, and run dry in the rainless seasons ; whereas all the permanent rivers rise in the mountain zone.

I have already made reference to the occurrence of red earth dunes below more modern ones at Kalmunai and elsewhere. The former have been preserved of course by the latter, which protect them from denudation. Blown sand is a fine protection, for as fast as it is removed, either by the wind or rain, it is replaced with fresh material ; but its action is often limited to a zone a few hundred yards in width around the coast. So one finds high rims of sedimentary rocks and plateau beds along the coast which separate flat country, standing but a very few feet above sea-level, from the ocean. An excellent example of this is seen at Mini-hagalkanda in the Southern Province. In this instance elevation has gradually raised the plateau beds above the influence of the blown sand, and now denudation is playing its usual part. From the present distribution then of plateau deposits and their typical occurrence on the summits of low hills, it follows that the geography of the low-country is distinctly different to-day

* In the case of the Maha-oya this can be traced with comparative ease, and I have no doubt whatever that some of the higher gravels of the Kelani river are part of the flaked series.

from what it was when these beds were laid down. It is quite certain that the valleys and flats separating these elevations have been carved out since plateau days. One can hardly escape from the conclusion that the present isolated outcrops once formed part of a huge plain surrounding the hill country of Ceylon. Since these outcrops are now well above the sea, though bordering upon it, it must follow that in plateau times the coast line cannot have been situated where it now is.

We may suppose, if we like, that the country as a whole stood at much the same elevation as it does to-day, but that the coast line was situated further out in what is now the Indian ocean ; or we may suppose that the country as a whole has risen in relation to the sea. From general considerations, which I will not go into now, the latter supposition is preferable. But I can produce something more than supposition. Near Ranna, in the Southern Province, some of the plateau representatives contain the shells of marine mollusca, similar to those which now inhabit the very shallow inlets of the sea that run into the coast, like salt pans.

The beds which hold these fossils are now some 50 feet above the ocean, while the breakers themselves are within shouting distance. We must believe then that the relative altitudes of sea and land have changed. Whether the ocean has subsided or the land has risen, or whether both have moved, I will not discuss in detail ; but since the plateau beds have undergone a small amount of folding, we know that the land is at least in part responsible.

What were the conditions under which early man lived in Ceylon ? When did he arrive ? Was he or was he not succeeded by another people before the Veddas came ?

Let us go back to the days before the plateau beds were deposited and discover, if we can, what in general were the then conditions of the country.

Ceylon is an ancient land. The great majority of its rocks are among the oldest known. They belong to what is called the Archæan epoch ; and some of them, according to the last pronouncement of my friend Mr. Arthur Holmes, who

determines the periods of geology by means of radio-activity,* were formed some fifteen hundred million years ago. The sedimentary beds, practically unknown in this country till recently, are on this basis comparatively modern.

How long the country of Ceylon has been above the ocean nobody can say ; but the extremely advanced stage of denudation of the mountains shows that many eons have passed since the rain first beat and the sun first shone upon this land.

Doubtless all have seen that wonderful view from the Haputale Gap, where one looks down upon the jungle across the tank of Hambagamuwa, and on to the sea 5,000 feet below and 40 miles away. And beneath the general level of the range you must have noticed the remnants of a vast plateau, which now, battered and dissected by the ravages of time, stands out as hills and pinnacles from the forest-covered plains. From Haputale this plateau, or periplane, is best observed ; but it can be traced with more or less distinctness all round the mountain zone. It is a wonderful relic of a time long past when the blue ocean lapped the highlands of Ceylon. Below the level of the periplane, which I call the mountain plateau, is the remnant of another, infinitely younger, yet almost as old may be as the human race itself. Over this vast plain roamed savage man ; perhaps a thousand centuries ago. The rivers began to carve their courses in the mountains before the periplane emerged ; probably they were hoary with age ere this event took place. That they had run for countless ages before the second periplane was formed is certain, for it can be shown that the former was dissected much as now when the plateau gravels were deposited. The rivers had taken their courses before denudation had carved away the less resistant portions of the mountain plateau, so that now we have the quaint anomaly of rivers cutting through hills instead of adopting easy routes around them.†

* Radio-activity and the Earth's Thermal History, Part II. (Geol. Mag. N. S., Decade VI., March, 1915, Vol. II., pp. 102-112).

† For example, the Kelani-ganga above Hadduwa cuts through a high rocky ridge, thus detaching the end of it from the main mass. The Kalu-ganga flows through the range between Nambapana and Dumbura.

The low degree of culture evidenced by the early plateau tools suggests that man first came to Ceylon on foot and not in ships. Moreover, the large mammalia must have come hither thus, so that we may infer a land connection between Ceylon and some other country, most probably India, in the past. It is reasonable to assume that our land stood higher then than now, since by a small elevation a connection with the continent would be established. Have we any evidence, then, that Ceylon was ever higher? Indeed, we have. Besides the buried plateau of the Pearl Banks, which seems to point to such conditions, we have the fact, which I was incidentally able to establish when boring in the Western Province and Sabaragamawa, that the ancient bottoms of modern rivers, vertically beneath their present beds, are now below sea-level. I will not elaborate this point, though its side issues are important; it is sufficient for our purpose now to realize that when man first came the land was higher.

Now we come back to the plateau gravels, which were deposited after man arrived; and when, as we have seen, the land was lower, at a time, too, when the connection with India had doubtless broken down. Who were these people? Did they make the frosted "Eoliths" which one finds associated with a better type of tool in the plateau beds? Are these, indeed, derived from older sites? For my part I answer *probably*. And the plateau gravel, how came it to be strewn about the ancient plain? How comes the plain at all? The surface of the beds below the gravel is likely enough an old sea bed converted into land by elevation; but the gravels are not sea gravels; of that I am persuaded.

They have none of the characters of a marine deposit. But that they were low-lying and liable in places to inundation by the sides we have already seen.

What cause can we ascribe to the midden-like accumulations and wide occurrence of these beds? Glaciers will not do; yet no other ordinary agency is half as capable. The cause seems catastrophic. An alternative suggests itself, and that is Noah's flood!

The legend of the deluge is so universal and so ancient that one can hardly escape from the conclusion that it originated

in some real occurrence. It may be, as Suess maintains, nothing more than a traditional account of a flood in the lower Euphrates valley ;* but the wide diffusion of the story is more easily understood, if it can be shown that the catastrophe which it chronicles was one affecting many countries of the world.

And can it be shown that any such event was probable ? I think it can. My friend Mr. Charles E. P. Brooks, in a masterly paper read before the Royal Meteorological Society three years ago,† showed how the influence of low temperature on the density of the air causes a permanent anticyclone to occupy the Arctic regions, and that within such regions precipitation must be very slight.‡ These conditions must have been very marked during the glacial period.

Now, although the precipitation for the world at large was probably below normal by reason of decreased evaporation caused by a general lowering of temperature, the outward blowing winds from the anticyclone deflected by the earth's rotation into a south-easterly and easterly direction allowed so little moisture to fall over the ice sheets that in unglaciated and tropical areas the annual precipitations must have been considerably above the normal. Evidence of a heavier rainfall in the past is widespread enough, for not only are most modern rivers too small for the valleys they occupy, but the great lakes, like those of Central Africa, Australia, Chad in the Sahara, lakes Bonneville, Lah Outan, Titicaca, and the lakes of Mexico in America, to mention a few, were very much larger in bygone days than now.

We in Ceylon who know what a monsoon shower can do, and have seen hundreds of square miles inundated in a day, may well shudder at the thought of what the rivers really could accomplish if they tried.

* "Das Antlitz der Erde." See English translation by Sollas, London, 1904, Vol. I., Chapter I.

† "The Meteorological Conditions of an Ice Sheet, and their bearing on the Desiccation of the Globe" (Q. J. R. Met. Soc., Vol. XL., No. 169, 1914, pp. 53-70).

‡ Investigations show that nearly all the moisture in the Arctic regions falls as snow, which measured in terms of rainfall seldom exceeds 10 inches a year.

And Ceylon is not a land of exceptional precipitation. Look at Cherra Punji in Assam, with its yearly average of 458 inches, "and a maximum record of 905 inches said to have fallen during the year 1861, of which 503 inches came down in June and July."* We who saw how choked the rivers were with sand after the rapid and disastrous floods of 1913 may well be glad that the rain stopped when it did, for otherwise the entire rice crop of the low-country would have been buried in a bed of mud and silt.

If the average yearly rainfall for Ceylon were as great as that of Cherra Punji, the low-country would be flooded out at least once a year.

Let us see how Mr. Brooks's contentions help us to interpret the plateau beds.

Across the plain formed by the emergence of the ocean floor rivers would flow, probably much as they did in previous days when the land was more elevated, and when man first came to the Island. For these upheavals are generally very slow affairs, and the rivers would have time enough to cut anew their courses as the country rose again. But these, we will assume, were the days of the Great Ice Age, when prehistoric man was living in Europe under conditions of intense cold. Precipitation, as we have seen (by the thesis noticed above), was greater then than now, and so we see the rivers filling their valleys in the hills and pouring forth in great volume over the plains below. The renewed energy of the running water engendered by the heavy rains, and the rising country, would enable it to carry enormous loads as long as the gradient was steep enough to permit of a high velocity. But once the streams poured forth upon the flats, much of their power would be lost, their channels choked, and their detritus spread abroad.† Large boulders would be dropped first, later the gravel, while some of the fine sediment would be carried out to sea or spread on distant portions of the plain.

* Pascoe, E. H. : *The Petroleum Occurrences of Assam and Bengal* (Mem. Geol. Survey, India, Vol. XL., Part 2, Calcutta, 1914, p. 274).

† The transporting power of a current varies as the sixth power of its velocity ; so that if the velocity be doubled, the transporting power is multiplied sixty-four times (see I. C. Russel's "River Development," London, 1909).

Seasonal variations probably existed then as now, and during the dry months the streams would dwindle, and seeds of grass and other plants brought down by the floods would germinate and grow, thereby giving rise to a patchy grass land vegetation and a splendid hunting ground.

In the quieter days that follow floods, a stream starts to scour its bed ; but at the beginning of the rains, before the load is heavy, this work is mostly finished. Thus, the rivers would tend to keep an outlet.

As time went on, the load would diminish, for the débris spread about the hills would have been disposed of. Moreover, the velocity of the rivers would diminish with their gradients. As the glaciers dwindled, too, in other lands, the rainfall would become more evenly distributed, and in the course of time normal conditions would supervene.

Such a state of things may well explain the plateau deposits. That the rivers played no small part in the deposition of these beds is manifest, for the poorest gravels are furthest from the permanent water-courses.

We have seen that elevation followed the formation of plateau beds, but, in spite of the energy thereby gained, the phenomena of the preceding period were not repeated. The rivers wanted volume ; the flood had passed, and with it the conditions of plateau days.

I will not insist that this was, indeed, the flood recorded in the Hebrew scriptures, but I suggest the possibility as a point of interest. Even could it be proved that the deluge and the abnormal rains of the Pleistocene were indeed one, it would not follow that early man had handed the story on to succeeding generations.

In fact, this would be most unlikely, since the conditions of the Ice Age were not cataclysmic, but of gradual increase and decline. It is quite possible that the story of the flood is the result of one of the earliest geological deductions man ever made. For consider this. At Minihagalkanda denudation in producing a cliff of a hundred feet in height has laid bare an outcrop of chert, from which comparatively modern stone-age man has shaped his implements. Now, he must have been able to recognize a chipped stone at least as well

as we, and in searching for materials with which to make certain of his tools, he was bound to come upon artefacts of a pre-existing time in the gravels near the cliff top. Savage man is an excellent observer ; doubtless he knew well enough that gravels are not in general deposited upon an elevation. Movements of the land were presumably unknown to him, and the rise and fall of tides was an everyday affair. A heavy flood, such as might occur at almost any time, would provide an explanation of the gravels. The extinction of a race of men, save a favoured few who carried on the race, might be read by Neolithic man by the light of the buried artefacts.

We have yet to show it probable that the plateau beds of this country are as old as the Pleistocene Ice Age of Europe, for without this probability our theory of the origin of the gravels is of little weight.

The only criteria which we have in this connection are the comparative results of denudation. But it may be argued that denudation is more rapid in the Tropics. I hardly think this is so, at any rate as far as Ceylon is concerned. Have we not in this Island inscriptions which have felt the sun and rains for a couple of millennia and yet are readable ? Would they have lasted better in Europe ? I doubt it. There is no evidence to show that denudation in Ceylon is more rapid than in Europe. Since the earliest Paleolithic days the Thames Valley has been carved, and many of the features of European geography produced. Here, in Ceylon, results comparable to these have been achieved since the red earth was laid down. Great areas of land miles in length and breadth and a hundred feet in depth have been gradually eaten away without the assistance of a great river. Witness, for example, the stupendous effects of subaerial erosion which have slowly accrued in the Southern Province since red earth times alone.

Secular movements of a widespread nature have impressed their influence on the country ; stone-age cultures have succeeded each other and passed away ; civilizations have risen and declined ; great cities have been built, and the trackless wilderness converted to a fertile plain. All this has passed ; the grasping jungle has regained its own, and European men have come, the Portuguese, the Dutch, and latterly

the British, with their goods, their gods, and their women to settle in the land.

History, as we know it, affords but a poor picture of man's activity. Aggressively foreshortened at best, it is all consequence and no foundation. Like the *Struldbrugs* of Swift's incomparable satire, the races of man have outlived the reach of memory.

Judged by the span of mortal generations humanity is old, ridiculously old, yet, we suppose, it has all before it. But the story of man is the last paragraph, as it were, in a whole library of chronicles; and well may we believe with the more moderate savants of the Western School that a hundred thousand years have gone since the Paleolithic savage first shaped his implements in Britain.

And if it were true of Britain, why not of Ceylon? The evidence of both is comparable in kind and in degree. The cradle of humanity is still unknown, in spite of many bold and ingenious contentions; but as facts accumulate, it becomes increasingly apparent that in those dim and far-off days stone-age people had multiplied and spread to many corners of the earth.

I submit then that we have reason to suppose that the plateau beds of Ceylon are comparable in age with the Paleolithic deposits of Europe, and that their formation may in part be explained by the meteorological conditions which accompanied the Ice Age.

As to the red earth which overlies the gravels, it is largely sand blown over the low-country from the seaboard, when the wet phase of the Pleistocene was passing or had passed. In red earth days much of the low-country no doubt resembled that sandy waste which borders the eastern coast of the Jaffna peninsula at the present time; dry and arid conditions must have supervened. From Cape Comorin in the Native State of Travancore one sees the fag-end of the Western Ghats protruding from a sand plain. Not far otherwise, if one allows for modern cultivation, must Ceylon have appeared to red earth man.

The period of denudation which followed the upheaval of the plateau beds gave rise to fresh deposits derived in no

small measure from those we have been studying. We may not consider these in detail now, but I cannot dismiss them without a few remarks.

One striking feature of the post-plateau deposits is their contrast in colour with their parent beds. They are never deep red, while some of them are dazzlingly white. These are the sands derived from the red earth and bleached by vegetation. While geologically younger, they are geographically lower than the red earth, but above the general level of the rice fields which were formed after them. They indicate swamp conditions in the past. Mineralogically they are of interest, in that they are practically pure silica, and historically they are of interest as the ground on which the Dutch chose to plant their cinnamon.

The beds of the paddy flats (rice grounds) which were formed after them have a history of their own, and they, the cinnamon grounds, and certain interesting shell deposits of local occurrence, may be correlated with the more recent sediments of the coast. Here, too, belong the white dunes of the *villus*.

I have on a previous occasion ("Spolia Zeylanica," Vol. X., Part 38, pp. 273 and 274) given a short account of the movements which these deposits indicate. I will say nothing further of them now beyond that I am strongly inclined to think that some of them at least belong to Neolithic days.

VI.—SUMMARY AND CONCLUSION.

To recapitulate. According to the evidence the following seems probable. Early man came to Ceylon from India by means of a then existing land bridge. He had not in those days reached the Paleolithic stage of culture; but he attained this later in the Island.

The downward movement of the land, which took place after man's arrival, was followed by an uplift; and on the coastal plains, thus widened by the exposure of the ocean bed, the now Paleolithic man hunted in the drier seasons.*

* Uplifts seem to have been as characteristic of the Pleistocene, as depressions were during the later carboniferous.

The climatic conditions of the Pleistocene period caused the rivers to fill their valleys and discharge their loads during one or both of the monsoons over the coastal flats. In these deposits were buried the implements of early stone-age man.

As the ice sheets of other lands retreated towards the poles, the rainy phase of the Tropics passed away ; and the drier monsoon winds, laden with the fine detritus of the coast, spread a mantle of sand over the low-lying regions. In those days the low-country probably resembled the arid waste which now exists on the eastern coast of the Jaffna peninsula. Later elevation re-asserted its sway, and the denuding agencies of rain and sun and wind began to develop the features of modern lowland geography.

With the new condition of things came Neolithic man, but whether of a race apart from the people of the Pleistocene nobody can say. Later still came the Veddas and the Naga people from Southern India,* and finally, the Sinhalese, whose advent brought the prehistoric epochs to a close.

The above, I submit, are outlines of the Stone Ages of Ceylon—sketchy outlines, nothing more.

A great deal of work must be accomplished and much detail added before these outlines can assume the aspect of a tolerable picture. Nor do I blind myself to the fact that some alteration of the outlines may be necessary. In the main, however, I fancy they will stand. For what they are worth I give them here now ; and it is for others to investigate and criticise.

If any one will take the subject up and work upon it systematically, he cannot fail to achieve valuable results. Moreover, if he is unable to carry on research in the wilder districts of the Island, where, in addition to the human interest of the work, he will experience all the romance of a jungle life, there is yet open to him a wealth of possibilities in more convenient spots.

* The Nagas were a Dravidian people who found their way to Ceylon before the Aryans arrived. Their chief stronghold appears to have been in the north of the Island.

For along the river valleys, in the gemming fields, in the beds of streams, and in a hundred other places relics of a long-forgotten past lie buried to him who will investigate is the joy of fresh discovery assured.

Much may be done if only people will keep their eyes open and record simple facts. Every fact, however isolated, is of value, though its true significance may not be gauged at once.

There are men among us who have done splendid service and will yet do more in the cause of science ; but the humblest may add his quota to the store of knowledge by the simple means of observation.

If there is any one in need of a hobby, but who feels himself unqualified to tackle the more intricate problems of biology, let him take up the work where I have dropped it ; for there he will find himself on the edge of a vast and unexplored territory, wherein he may accomplish far more than it has been my humble lot to do for the Natural History of the Island.

I have to express my indebtedness to Mr. G. M. Henry for kindly undertaking to draw the figures, and to Mr. C. Hartley, not only for the helpful criticism and advice, from which the author has on many occasions profited, but also, and chiefly perhaps, for performing the onerous task of seeing this paper through the press.

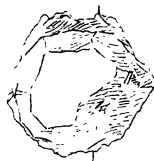
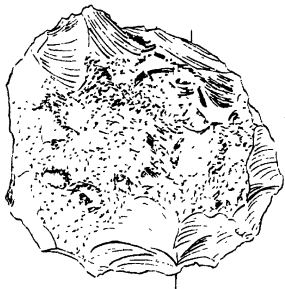
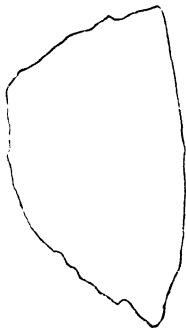
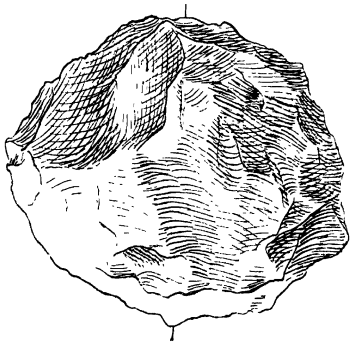
APPENDIX A.

The Human Period is subdivided as follows :—

Holocene	{	Historic Age	{	Modern races	{	Modern species of man
		Early Iron Age		of man		
		Bronze Age				
		Neolithic Age				
Pleistocene	{	Paleolithic	{	Magdalenian	{	Extinct species of man
				Solutrean		
				Aurignacian		
				Mousterian		
				Acheulean		
Pliocene	{	Pre-Paleolithic	{	Chellean		
		Eolithic				
		Sub-Crag				

CONES

Plate I.



HOLLOW SCRAPERS



Plate VI.

ES

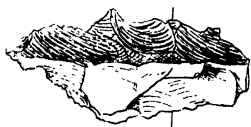


Plate VI.

ES

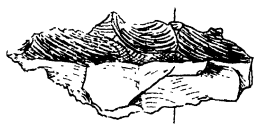


Plate III

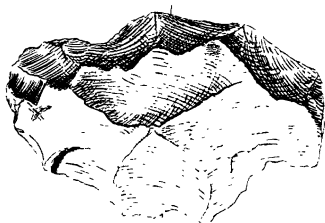


Plate VI.

LAKES

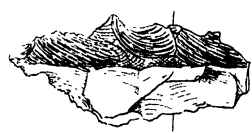
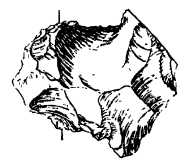
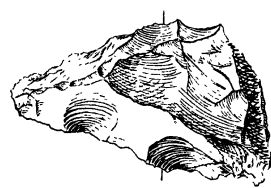
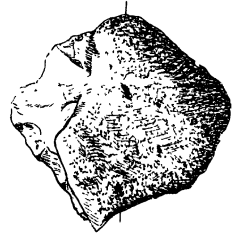
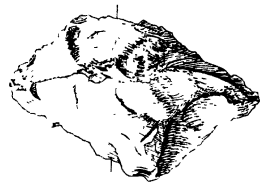


Plate IV.

POINTED

SLUG PLANE



POINTED

Plate VI.

LAKES

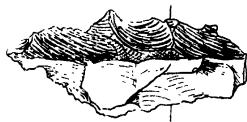
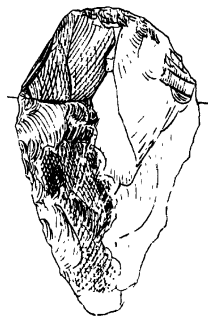
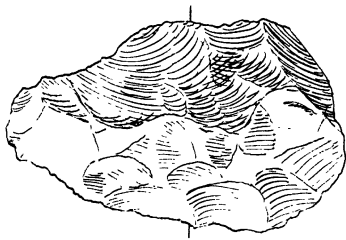
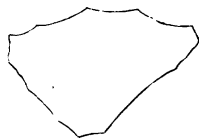
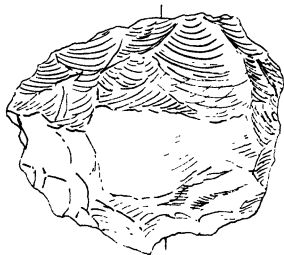
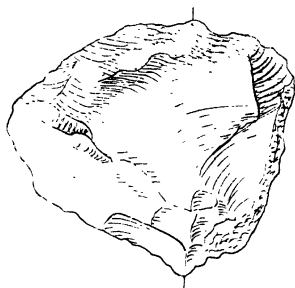
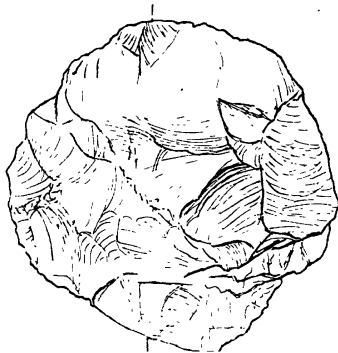


Plate V.

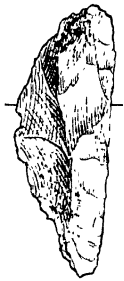
HAND AXES



DISCS



WORKED FLAKES



WORKED FLAKES

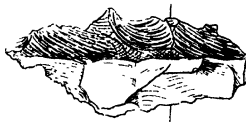
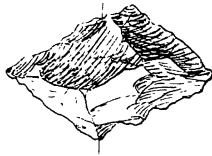
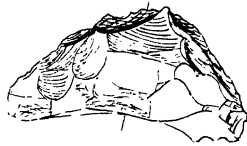
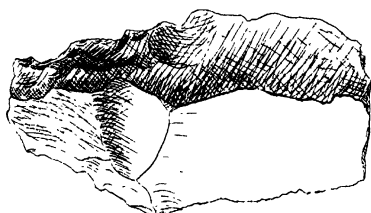
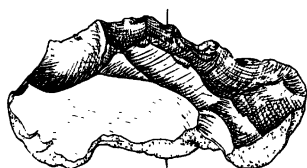
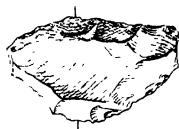
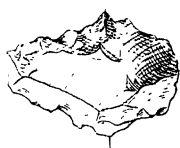


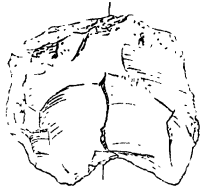
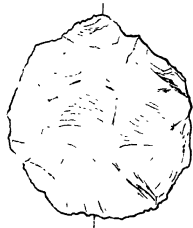
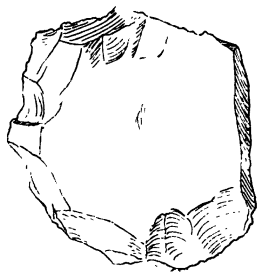
Plate VIII



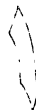
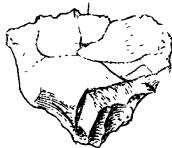
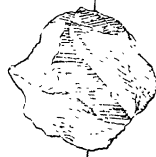
Plate VII.



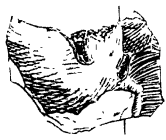
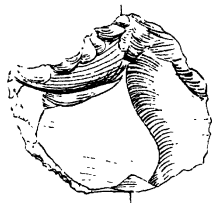
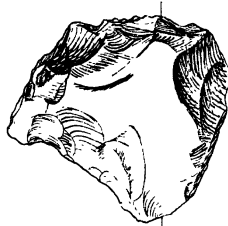
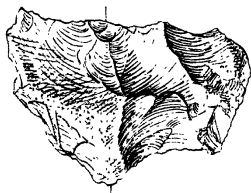
OVATE SCRAPERS



WORKED FLAKES



BEAKED



The exact range in time of the extinct and modern species of man is at present a little uncertain. *Homo sapiens* certainly existed in the Magdalenian Period, while some now extinct species were probably still living. No human remains indisputably older than the Chellean Period have yet been discovered. Those which have come to light from the older Paleolithic deposits, however, all belong to extinct species. The subdivisions of the Paleolithic Period are based on discoveries in Europe, and have not yet been proved to have a world-wide application. The question of Eolithic and Sub-Crag "implements" is still being debated. There are high authorities on both sides.

APPENDIX B.

Laterite is a product of decomposition of igneous, metamorphic, and sometimes sedimentary rocks. It is the substance well known in Ceylon as "*Kabook*."

The origin of laterite has given rise to considerable discussion; and the term itself has had more than one definition. Geikie (Text Book of Geology, London, 1903, Vol. I, p. 169) defines it thus:—

"A cellular, reddish, ferruginous clay, found in some tropical countries as the result of the subaerial decomposition of certain kinds of rock, as granites, gneiss, diorite, and basalt; it acquires great hardness after being quarried out and dried. The peculiar kind of alteration exemplified by this rock and by Bauxite (hydrated aluminium oxide) has been termed 'laterization.'"

A good description of laterite will be found in "A Manual of the Geology of India" (Medlicott and Blanford), Calcutta, MDCCCLXXIX., pp. 348-370.

NOTES ON CEYLON BUTTERFLIES.

Part II.

By W. ORMISTON, F.E.S.

(With seven Plates.)

Abbreviations after Names.

M. = Moore : Lepidoptera of Ceylon.

B. = Bingham : Fauna of India : Butterflies.

De N. = De Niceville : The Butterflies of India, Burma, and Ceylon.

E. = Evans : A List of Indian Butterflies.

PAPILIONIDÆ.

Pierinæ.

147. *LEPTOSIA XIPHIA*, B. & E.; *Nychitona xiphia*, M.—Also found in India and Malaya.

Very common in jungles all over the low-country. It becomes much scarcer above 2,500 feet elevation, and is rather a rarity at Haldummulla. A native collector once brought me a specimen said to have been caught at Ohiya (6,000 feet). Though mainly a jungle fly, it sometimes appears in open country, and I have noticed it in the Fort at Galle, and it is common in the town of Jaffna.

I have two specimens from Mannar (January—wet season). They are very small, but have an exceptional amount of black, the post-discal spot being joined by a black line to the black on the terminal margin; one of these specimens also shows a very fine black marginal line on the lower wing. With these exceptions, I have noticed very little variation.

It is the slowest flying butterfly I know, and is nearly always found fluttering low on the edge of the jungle, so is very easy to catch. It flies all the year round.

148. *DELIAS EUCHARIS*.—Found also in India and Burma.

It is abundant everywhere, at all elevations, and flies all the year round.

The larva feeds on *Loranthus*, but wanders some distance to pupate, as the pupa, which is very conspicuous, may be found anywhere : on bungalow walls, rocks, &c.

It usually flies rather high, but comes readily to flowers, especially *Duranta*. It is not given to settling on wet roads, like the next species (*P. sita*).

The female varies greatly in the width of the black markings, and I have also taken two or three specimens of a variety in which the white of the upper surface is replaced by yellow. I have found this form rare, but a native collector assures me that he has frequently seen it in the Ratnapura District, so it is apparently a wet season form.

149. *PRIONERIS SITA*.—Also found in Southern India.

A well-known mimic of the last (*D. eucharis*). The males can be distinguished by their stronger flight, their much more pointed fore wings, and the absence of the post-discal band on the upper side of the fore wing. The real mimicry is, as I believe is always the case among Ceylon butterflies, shown by the female. She has a much slower flight than the male, the fore wing is not so pointed, and the post-discal band is almost as well marked as in *eucharis*, the resemblance being even greater on the wing than in the cabinet. On the under side the mimicry is not quite so perfect; the marginal spots on the hind wing being vermillion instead of carmine, and they are broadest at the margin, whereas in *eucharis* they come to a point there. Seitz, in his work on Butterflies, states that *eucharis* is white at the apex of the fore wing below and *sita* is yellow. In all my specimens both are yellow.

The male is common all the year round at Haldummulla, especially during the south-west monsoon, and may be seen day after day in the same place. It flies fast and high, going round the same trees for hours, often in company with *eucharis*, but it comes to flowers, especially *Lantana*, early in the morning, and often settles on wet patches on the roads in the heat of the day, so it is not difficult to procure. The female is very seldom seen, or, if seen, is mistaken for ♀ *eucharis*.

I once came on females in numbers settled on an evil-smelling blossom in the Amherst gap, Uda Pussellawa, in company with *H. remba*, but not a specimen was perfect.

I have taken it from 500 to 6,000 feet elevation in Uva, and have specimens from Uda Pussellawa, Balangoda, and the hills above Ratnapura.

150. CATOPSILIA CROCALE, B. & E.; *Catopsilia catilla*, M.

151. CATOPSILIA POMONA, E.; *Catopsilia crocale*, M., B., & De N.—Also found in India, Malaya, and Australia.

De Niceville and Bingham treated these as one species, but Bell has found that their larvæ are distinct. They can be distinguished as follows:—

Crocale.—A conspicuous reddish pearl-centred spot at the end of the cell on the under side of both wings. Antennæ plum coloured.

Pomona.—The spots at the end of the cell usually absent in the ♂, and absent or inconspicuous in the ♀. Antennæ blackish-brown.

C. crocale ♂ varies very little. The ♀ has two forms: one sulphur-yellow, and the other cream colour. The first is by far the most common. *Var. catilla* is the variety of ♀ *crocale*, with large reddish blotches in the centre of the under side of both wings.

C. pomona ♂ varies in the amount of yellow on the upper side. The ♀ is very variable in ground colour and the amount of the black markings. I have no specimens of as bright a sulphur-yellow as normal ♀ *crocale*.

Both species appear in enormous numbers in the flights, but are not usually at their maximum at the same time. These flights of *crocale* will be found almost always to consist of well-grown specimens of 2 inches to 2½ inches in expanse. In *pomona*, on the contrary, dwarfs of under 2 inches form the great majority.

152. CATOPSILIA PYRANTHE.—Moore divided this into *pyranthe*, *ilea*, and *chryseis*. Found also in India and Malaya.

It is very plentiful at times everywhere, but chiefly so at a low elevation. It seldom appears at Haldummulla, except during the north-east monsoon flights, but I have often seen it laying its eggs then. This district is exceptionally well stocked with small insectivorous birds, and I fancy the great majority of the larvæ fall a prey to them. To observe this

better I have grown the food plant in a flower pot in my garden, and, though I have seen a large number of eggs being laid, I have so far failed to find a single half-grown larva on the plant.

It is very variable, but all the varieties grade. The one named *chryseis* by Moore is by far the rarest.

153. *CATOPSILIA FLORELLA*, B. & E.; *Catopsilia gnoma*, M.—Found in Africa, Persia, Afghanistan, Siam, China, &c.

C. florella differs mainly from *pyranthe* in the terminal border of the fore wing; *pyranthe* has a *continuous* band, broad at the apex and narrowed posteriorly; *florella* has a narrow *macular* band, as broad in interspace 2 as at the apex. The difference is only clearly shown in the females.

The female is occasionally very plentiful in Ceylon, and is found in company with *pyranthe* from Galle to Jaffna. I am uncertain if I can distinguish the male from *pyranthe*, as it seems to grade perfectly. The female is certainly very distinct on the upper side, but typical specimens of ♀ *pyranthe* may be found with the under side coloured almost as in *florella*. The antennæ of *florella* are said to be plum coloured, and those of *pyranthe* dark brown, but I have not found this test reliable. Personally I suspect it to be only a seasonal variety of *pyranthe*, but I hope to induce a ♀ to lay her eggs in captivity and so settle the point. Breeding experiments by Mr. O. S. Wickwar and the late Colonel Manders seem to prove that *gnoma* is a wet season form of *pyranthe*, but I am not sure that *gnoma* = *florella* in this case.

It is commonest at Haldummulla in November and December, viz., during the north-east monsoon flights.

“Found in the Minneriya-Polonnaruwa country” (F. M. Mackwood).-

154. *TERIAS LIBYTHEA*, B.; *Terias drona*, M.; *Kibrecta libythea*, E.—Found also in India and Burma.

This is a most variable insect in size, shape of the wings, and markings, and I consider that the variation is seasonal, the extremes being the cold and warm season forms respectively. They grade perfectly into one another. See Pl. 2, figs. 1 and 2.

In the cold season form the apex of the fore wing is acuminate, the black marginal band on the fore wing is interrupted by a narrow yellow patch in interspace 1. The band

on the lower wing is broken up into a broad apical patch reaching to interspace 5, followed by triangular spots at the ends of veins 2 to 5, continued a little way up each vein. There is usually a pink border to the under side of the costa of the fore wing, and the cilia are sometimes salmon-pink, as given by Bingham. In the warm season form the apex of the fore wing is more rounded, and the black marginal band on both wings is unbroken, being continuous from the apex of the fore wing to the tornus of the hind wing. The pink border to the under side of the costa is never present, and the cilia are pale yellow mixed with black. On the under side of the fore wing there is occasionally a distinct narrow pre-apical black streak running from the costa to vein 4. All the other markings are more obscure.

The cold season form is rare, and is most likely to be taken at Haldummulla from January to March, a cold, dry season following the rains. The warm season form is very plentiful here all the year round, and is found everywhere on the patanas of Uva from 500 to over 6,000 feet elevation. It is common at Galaha, near Kandy.

The size of my specimens varies from 26 to 45 mm. in expanse, dwarfs being by far the commonest.

155. *TERIAS VENATA*, B. & De N.; *Nirmula venata*, E.; *Terias cingala* and *rama*, M.—Found in India, China, the Philippines, &c.

Moore separated this into *cingala* and *rama*, and, taking extreme examples, the difference is considerable, especially in the females. *Cingala* has the apex of the fore wings rounded, *rama* has it acuminate. Other differences are:—

In *cingala* ♂.—Upper side: The black border of the fore wing is but slightly, if at all, narrowed below vein 1, and it is continued as a fine black line the whole length of the dorsum to the base; its inner edge is very slightly produced inward along veins 2 and 3; there is a distinct black streak on the disco-cellulars, and the veins of the upper half of the wing are marked out in black; the sex mark is large.

Under side: All markings are very indistinct; on the fore wing there is usually a minute black spot at the upper apex

of the cell, and others at the end of each vein, but all these are sometimes absent. The discal bands on the hind wing, though faint, can always be distinguished.

In *rama* ♂.—Upper side : The black border of the fore wing is abruptly narrowed below vein 1, and is not continued along the dorsum ; its inner edge is strongly produced inwards along veins 2 and 3 ; there is no disco-cellular streak, and the veins are not marked out in black ; the sex mark is smaller.

Under side : There is a distinct black linear spot at the upper apex of the cell. On the lower wing there is a black spot in the basal half of 7, and a series of three dusky spots across the wing near the middle of the cell. The discal bands are very clearly marked.

In *cingala* ♀.—Upper side : The black border of the fore wing is of nearly even width from vein 4 to the tornus, and it is usually produced a short distance along the dorsal margin ; on the hind wing it is broad at the apex, but narrows *gradually* to the tornus ; there is a fine black line on the disco-cellulars of the fore wing.

In *rama* ♀.—Upper side : The ground colour is much brighter ; the black border of the fore wing is broken below vein 2, and continued to the tornus as a fine line ; on the lower wing there is a broad apical black patch, but it narrows *abruptly* in interspace 5, and is continued thence to the tornus as a narrow black line ; there is no mark on the disco-cellulars of the fore wing.

Under side : In *cingala* it resembles the ♂. In *rama* it answers nearly in ground colour and markings to Bingham's description of *T. læta*, wet season form.

The males are fairly constant, but it is possible to grade them. The females are very variable, and grading is easy. I believe that *rama* is the cold and *cingala* the warm weather form of our Ceylon race. The differences between them coincide very nearly to the seasonal variations of *T. libythea*. See Pl. 2, figs. 1 to 6.

Cingala is very plentiful on the Uva patanas, from 500 to 3,000 feet elevation. *Rama* is not so common, and is chiefly

found from 3,000 feet upwards, at Haputale, Ohiya, &c. I found *cingala* very plentiful at Galaha, near Kandy. Although I have always regarded *cingala* as by far the commonest form, it is curious that the Colombo Museum did not possess a specimen till I sent them some a few years ago. They had, however, a very fine series of *rama*.

I have an exceptionally large specimen of *cingala* ♀, in which the ground colour is nearly white.

The next group of *Terias* have always given a lot of trouble, as the species have a wide range, and are very variable. Moore split it into seven species in Ceylon, viz., *hecabe*, *hecabeoides*, *simulata*, *citrina*, *uniformis*, *rotundalis*, and *templetonii*. Manders and De Niceville (A List of the Butterflies of Ceylon) reduced the number to three: *hecabe*, *silhetana*, and *sari*. Bingham and Evans do not give *silhetana* from Ceylon; the former allows us *hecabe* and *sari*, and the latter *hecabe* and *andersoni*.

Mr. E. E. Green, writing in "Spolia Zeylanica," Vol. VIII., Part XXX., gives *silhetana* and *hecabe*, and distinguishes them as follows:—

"*hecabe*.—Outer margin of fore wing entire; marginal area of costa distinctly black; lower extremity of black border not subtended by yellow.

"*silhetana*.—Outer margin of fore wing distinctly crenulate; marginal area of costa yellow; lower extremity of black border partially subtended by yellow."

My objection to this is that I have several *hecabe* in which the basal half of the costal border is yellow, and *silhetana* in which it is black. In a variety of *silhetana* mentioned later it is almost always black.

Bingham separates the Indian species as follows:—

Three spots in base of cell = *silhetana* or *moorei*.

Two spots in base of cell = *hecabe*.

One spot in base of cell = *andersoni* or *sari*.

My objection to this is that one or both of the spots in *hecabe* are frequently obsolete in Ceylon specimens.

My own opinion is that we have three species in Ceylon, which, making use of both Green's and Bingham's tables, I would define as follows :—

Three spots in basal half of cell ; terminal margin of fore wing distinctly crenulate ; lower extremity of black border of fore wing usually subtended by yellow = *silhetana*.

Not more than two spots in cell ; if only one, it is usually rather indistinct ; terminal margin of fore wing entire ; lower extremity of black border of fore wing never subtended by yellow = *hecabe*.

One very distinct black streak in cell ; terminal margin of wing entire, or very slightly crenulate ; lower extremity of black border of fore wing distinctly subtended by yellow = *rotundalis*.

156. *TERIAS HECABE*.—Found in India, Malaya, China, &c.

Moore also gives *hecabeoides* and *simulata*, but these are now regarded as varieties only. It is very variable in markings and in size, and a dwarf form from 25 to 30 mm. in expanse is very common at Haldummulla.

While in the Northern Province in November, 1915, and January, 1916 (wet season), I noticed that a large number of specimens showed exceptionally few markings on the under side. I caught many with both spots in the cell wanting, others with only one spot, and even a specimen with two spots on one wing and none on the other. More than half of those I caught were abnormal. I have subsequently found similar varieties plentiful at Haldummulla, Kottawa, &c. On the upper side the markings are normal, but the colour of the females is rather paler than usual, the under side of the hind wing being, as a rule, very pale. There are two specimens in the Colombo Museum labelled *T. sari*, which are, I believe, only this variety of *hecabe*. They are very unlike Indian specimens of *sari*.

It is one of the commonest butterflies everywhere in the Island, and both wet and dry season forms fly together all the year round.

157. *TERIAS SILHETANA*.—Moore gives *citrina*, *uniformis*, and *templetonii*. From the illustrations the two former are

clearly only varieties of *silhetana*, and the latter is described as having three spots in the cell. Also found in India, Burma, and Malaya.

It is as common as the last in the hills, but less plentiful in the low-country. I have taken it all over the southern half of the Island, but not so far in the north. When *Albizzia moluccana* was first planted through the tea it became a pest, but latterly its natural enemies have kept it fairly well in check. The best way to get fine specimens and varieties is to find an *Albizzia* leaf of which all the soft part has been eaten, and the pupæ are hanging about an inch apart along the ribs. Thirty to forty pupæ may be found on one leaf, and a fine series of varieties will probably hatch out, as the wet and dry season forms fly together. These pupæ on *Albizzia* leaves are always black, but a few larvæ sometimes descend and pupate on the under side of tea leaves; these pupæ are usually green.

It is extremely variable, and cream-coloured specimens are not at all rare. With one possible exception mentioned below, every specimen I have seen had three spots in the basal half of the cell, but Manders mentioned one in his notes in which the basal spot was "almost obsolete." There is a variety found in the wettest forests, the male of which was described by Moore as *rotundalis* ♂, probably because it is usually found in company with that species. It differs from normal *silhetana* in the narrower and more intense black borders to both wings, that on the fore wing being usually continued to the base of the costa, and that on the hind wing being clearly defined, never diffuse, as usual, in *silhetana*. The reddish-brown apical patch, when present, is a narrow streak from the costa to vein 4, as in *hecabe*. There are three basal spots in the cell. On the lower wing below there is a black streak across the angle at the base of vein 8, which I find in all my *silhetana*, but never in *hecabe* or *rotundalis*.

Mr. A. C. Hayley has given me a specimen, which I believe to be an aberration of *silhetana*. The spots in the basal half of the cell have coalesced into one large irregular figure, and the black streak across the angle of vein 8 on the hind wing is wanting.

158. *TERIAS ROTUNDALIS*, M.—Occasionally plentiful in forests in the wettest zone, but rare elsewhere. Mr. Mackwood, who is by far the greatest authority on our butterflies, has always insisted on its claim to specific rank. See Pl. 2, figs. 7 and 8.

At the first glance the upper side of the ♂ is very like a variety of *silhetana*, but its rounded wings distinguish it. On the under side of the fore wing there is only one very dark streak in the basal half of the cell. It answers nearly to Bingham's description of *andersoni*, but in the specimens I have examined the inner margin of the black border of the fore wing is very rarely angulated on vein 7, and the ground colour of the under side is not noticeably paler than that of the upper. Moore's figures of the under side, and of what he calls the female, are fair. That of the male is, I believe, that of a variety of *silhetana*. The female resembles the male in the shape and markings of the fore wing, but is paler in colour. The border of the hind wing is a very fine black line, widening out into slightly diffuse triangular spots at the end of each vein. This border is sufficient to distinguish the female from any other Ceylon *Terias*.

The reddish apical patch below is wanting, its place being sometimes taken by an indistinct patch of black scales. Judging from my specimens, this species varies less than any *Terias* in Ceylon.

Evans writes : "*sari* is recorded from Southern India and Ceylon ; the only specimens in the British Museum marked as such are two from Ceylon, which may be *andersoni*, but are certainly not *sari*." It would be interesting to see if these are *rotundalis*.

Pending a decision as to whether this is *andersoni*, or a race thereof, I retain Moore's name.

I have taken it at Wellawaya and Buttala in the low-country of Uva, and have specimens from Kandy, but it is apparently only plentiful at Ratnapura and in other very wet forests.

159. *IXIAS CINGALENSIS*, M. ; *Ixias pyrene cingalensis*, E. ; *Ixias pyrene* var. *cingalensis*, B.—Moore also gives *pirenassa*, under which name he describes the dry season form.

It is peculiar to Ceylon, but is very near *pyrene*, from which it differs in having the ground colour of the fore wing extended into the base of interspace 3. This seems to be constant, though very variable in amount.

The males vary chiefly in the width of the black border of the hind wing and the amount of markings on the under side. The females vary in the same way, but the band on the fore wing also varies much in width and colour. In specimens from the north this band is usually yellow or pale orange, in those from the south it is almost always deep orange. In Ceylon the ground colour of the female is, I believe, always yellow, slightly paler than that of the male.

It is an insect of the dry low-country, but in some years it joins in the flights in November–December, and may then be found anywhere. I have known it then common at Haldummulla, Peradeniya, and Galle, none of which places are its usual haunts. It is very plentiful in the low-country of Uva and at Anuradhapura, but becomes rarer in the Northern Province. It is not easy to catch, as it is usually found among thorny bushes, and dives into them to escape. The female is especially hard to procure in good condition. The males sometimes settle on wet patches on the roads or in river beds.

“From North Matale to Anuradhapura and Puttalam”
(F. M. Mackwood).

160. *IXIAS MARIANNE*.—Also found in India.

Its habitat is much the same as that of the last, but it prefers more open country, and is commoner in the Northern Province. It is very plentiful in the Jaffna and Mannar Districts. It flies more away from the thorny bushes, and is therefore much easier to catch. I have never seen it settling on wet patches on the roads. I have once only seen a specimen at Haldummulla during the flights, and, in my opinion, it does not “flight.”

The male varies very little, but in the female the black inner border to the orange band is sometimes missing between veins 2 and 4, and the ground colour of the under side varies greatly.

A melanism of the ♂ of this species, captured by myself in the Hambantota District, is described and figured in “*Spolia Zeylanica*,” Vol. IX., Part XXXIII.

161. *COLOTIS AMATA*, B. ; *Idmais modesta*, M. ; *Colotis amatus*, E. ; *Teracolus amata*, De N.—Also found in Africa. Persia, Arabia, and India.

It is not common in the Province of Uva, except near the boundaries of the Southern and Eastern Provinces. I have taken a single specimen at Wellawaya. It is very plentiful in the drier districts, especially in the Southern Province, from Tangalla to Hambantota, Anuradhapura, Jaffna, Mannar, &c.

The males vary little, but the females grade perfectly from salmon colour to almost pure white, specimens as dark as the males being by far the rarest ; they also vary considerably in the ground colour of the under side.

They fly slowly near the ground, and settle frequently. so are very easy to catch.

162. *IDMAIS TRIPUNCTA*, M. ; *Teracolus tripuncta*, De N. ; *Colotis fausta tripuncta*, B. ; *Madais fausta fulvia*, E.—Also found in India.

Moore figures the female the same colour as the male, but all the specimens I have seen have been white. The markings are the same in both sexes, so, if a salmon-coloured female exists, she could only be distinguished by the different shape of the dorsal margin of the fore wing and the absence of the sex mark, which is a small oval patch of specialized scales on the under side of the fore wing above the basal half of vein 1.

It is found only in the north of the Island, and is never plentiful. It has a very strong flight in the middle of the day in bright sunshine, but is easier to catch in the early morning. I have taken a few males at the blossom of *Cudaba indica*. It seems to frequent forest country more than any other member of the group, with the exception of *amata*.

There is a fair amount of seasonal variation, but the dry season forms, especially of the female, seem to be very rare.

I have specimens from Puttalam (October), Murunkan (July and November), and Elephant Pass (November to January), and I saw a fair number from the train near Madhu Road, on the Mannar line, in November.

163. *CALLOSUNE LIMBATA*, M. ; *Teracolus limbatus*, De N. ; *Colotis etrida limbata*, B. ; *Callosune etrida limbata*, E.—Peculiar to Ceylon, but is an insular race of the Indian *C. etrida*.

It varies considerably, but the race seems to be well established everywhere, except in the Mannar District, where specimens that are very close to typical *etrida* may be taken in company with typical *limbata*. Their flight is so weak that it is difficult to imagine specimens of *etrida* crossing by Adam's Bridge, so they may only be extreme dry season forms of *limbata*; they are almost invariably very dwarfed. (My specimens vary from 21 to 32 mm. in expanse.) In this connection I may mention that I have taken a specimen of *limbata* on the cart road at Haldummulla, at least 50 miles from its usual haunts. I believe in this case that the insect had pupated on a Hambantota salt cart, and hatched out on the road to Haputale. Specimens might, therefore, be easily brought over from India in a similar manner on the native boats, and thus interfere with the complete establishment of the race in the Mannar District.

It is found all round the north and east coasts from Chilaw to Tangalla, but its range does not, as a rule, extend for as much as 10 miles inland. The largest and darkest specimens are found in the Hambantota-Tangalla District. It flies close to the ground, and is very easy to capture.

"Particularly abundant in Fort Frederick, Trincomalee" (F. M. Mackwood).

164. CALLOSUNE EUCHARIS, M. & E.; *Colotis eucharis*, B.; *Teracolus eucharis*, De N.—Also found in India.

Confined to the north of the Island and never found very far from the sea. It is very abundant in places in the Mannar and Jaffna Districts, especially near Giant's tank.

Both sexes are very variable, and the variation seems to be largely dependent on season. In the dry season form of the male the black is confined to an external border to the orange patch on the fore wing, and very minute spots at the end of the veins on the hind wing. In the wet season form there is a large black patch on the fore wing below the orange, extending to the tornus, another small one on the costa at the commencement of the orange, and traces of an inner border connecting the two. The black spots on the hind wing are much larger, and sometimes coalesce to form a black border. In the females the orange spots at the apex vary in number from 3

to 5, 4 being the usual number; the orange often extends into the wing within the inner border of the black area. In some specimens the apical spots are nearly white. This may be the result of fading, as the majority of those I have caught were worn specimens. I have, however, failed to produce the effect by exposing dead specimens to sunlight for some weeks. The under side of both sexes varies greatly in ground colour and markings.

In bright sunshine its flight is rather fast, though low, and owing to the thorns it is not easy to catch. In cloudy weather it flies little, and, if beaten up, is easily taken.

165. CALLOSUNE DANÆ, M. & E.; *Colotis danæ*, B.; *Teracolus danæ*, De N.—Moore also gives *sanguinalis*, which is only the small dry season form. Also found in India and Persia.

I have never seen it out of the Northern Province, though I believe it has been taken at Puttalam. It is extremely plentiful in the Mannar District, and is not rare at Kankesan-turai on the Jaffna coast. The females are usually much scarcer than the males, but I found them in profusion at Murunkan in July.

It flies with *C. eucharis*, and has the same habits, its flight in bright sunshine being rather fast, but it is easy to catch in the early morning or in cloudy weather. Both species congregate round bushes of *Cadaba indica*, which is apparently the chief food plant of their larvæ in Ceylon, and they may be found roosting at the foot of these bushes in the evening, and the finest specimens can be easily selected.

It seems to vary much less than either *eucharis* or *limbata*, the chief variation being in the ground colour of the under side. Dry season specimens are very often dwarfed.

166. BELENOIS TAPROBANA, M.; *Anaphæis mesentina taprobana*, B. & E.—Peculiar to Ceylon, but is an insular race of *B. mesentina*, which is found from Africa to India.

It is very variable, but seems to be well established as a race, except in the north of the Island. I have single specimens from Jaffna and Mannar, and have seen one from Anuradhapura, which are very near typical *mesentina*, though the under side of the hind wing is chrome-yellow in all. It is much given

to "fighting," especially during the north-east monsoon. During these flights it is common at Haldummulla, Kandy, and Galle, which are much further from its normal haunts than the distance across Adam's Bridge, so it is easy to understand the introduction of fresh blood, from the parent species, in the north.

It is very plentiful in the drier parts of the Island, especially in the Hambantota and Mannar Districts. The cream-coloured variety of the female is commonest in the wet season.

167. *HIPOSCRTIA NARENDRA*, M. ; *Appias indra narendra*, B. ; *Hyposcrtia indra narendra*, E.—Also found in Southern India.

I have never come across this butterfly, my only specimen being a male from Ratnapura given to me by Mr. Mackwood.

"Found also at 3,000 feet elevation in the country north of Matala and the Knuckles Mountains" (F. M. Mackwood).

168. *CATOPHAGA VENUSTA*, M. ; *Appias albina*, B. ; *Catophaga albina venusta*, E.—Also found in India, Burma, Malaya, &c.

Moore divides it into *venusta* and *neombo*. I have never seen anything at all resembling his figure of *neombo* ♂, but those of the female and under side are clearly lightly marked varieties of *venusta*. It is, however, curious that he describes *neombo* as extremely plentiful, and *venusta* as having been taken only at Vavuniya. In both the white and yellow varieties of the female specimens may be captured in which the pre-apical black band on the under side of the fore wing is obsolete, except for a round spot in interspace 3. This variety, however, grades perfectly into the normal.

The male can be distinguished from the next (*C. paulina*) by its more pointed wings. The female can be distinguished by having the outer margin of the black band on the under side of the fore wing, irregularly zig-zag, never regularly curved as in *paulina* ♀. It has in addition, as a rule, four or five white spots at the apex of the fore wing above, while *paulina* has almost invariably only 3; but I have specimens of *venusta* in which these spots are reduced to two, those in interspaces 3 and 4 being obsolete.

It is very plentiful everywhere during the flights, but is not often found at high elevations, except when these are on.

169. *CATOPHAGA PAULINA* ; *Appias paulina*, B. ; *Catophaga melania paulina*, E.—Also found in Malaya, Siam, and Java.

Moore divides it into *galene* and *lankapura*. In *galene* ♀ the under side of the hind wing is pearly white, while in *lankapura* ♀ it is yellow. They are now regarded as varieties only.

It is very variable. In heavily marked specimens of the male the costa and apex of the fore wing are heavily irrorated with black scales. This dark area is widened on the termen in interspace 3, and then narrowed abruptly, stopping before vein 1. On the hind wing there are black spots on the termen at the end of each vein, and the tornus is irrorated with black scales. In the lighter marked specimens the black scaling is restricted to the costa, and a small patch at the apex of the fore wing. The female varies much in the width of the apical black area, and in the colour and markings of the under side. The variations may be seasonal, but all varieties fly together at all times.

It is extremely plentiful all over the Island during the flights, and single specimens may be found everywhere all the year round.

“Up as high as Pattipola, 6,000 feet” (F. M. Mackwood).

170. *APPIAS LIBYTHEA*.—Also found in India.

This is another most variable species, especially in the case of the females. In the males the variation seems to be largely dependent on locality, the darkest specimens being most often found in the south-east of the Island, in the Hambantota-Tangalla country. This does not, however, apply to the females, as the most extreme forms always fly together, and my lightest and darkest specimens were taken on the same day at Murunkan (Mannar District) in July—dry season.

The male is very similar to *C. venusta* ♂, but can be distinguished by the absence of the yellow tint on the under side of the hind wing. This is usually pure white and unmarked, but there is sometimes a small yellow patch at the humeral angle. I have two specimens which have black spots at the ends of the veins of the hind wing above; on the under side there are diffuse black spots at the ends of veins 2 and 3 of

the fore wing, the terminal halves of the veins on the hind wing are very lightly marked with grayish-black, and there is a narrow gray marginal line at the tornus.

It is normally an insect of the dry low-country, but it often joins in the November–December flights, and may then be found at any elevation. I received a very dark variety of the female from Ohiya (6,000 feet) in October, 1917, before the flights had started. It was in perfect condition, not like those that have “flighted” far; it may, therefore, occasionally breed in the hills.

I have found it especially abundant in the Hambantota District in March and May, and in the Mannar country in July, November, and January.

“Also Anuradhapura in December” (F. M. Mackwood).

171. *APPIAS TAPROBANA*, M.; *Appias hippo taprobana*, B.; *Appias lycida taprobana*, E.—Moore also gives *A. vacans*, which is only a lightly marked variety.

Bingham separates the race *taprobana*, from Southern India and Ceylon, from *hippo*, by the fact that, on the under side of the hind wing, the sub-costal vein and veins 6, 7, and 8 are conspicuously edged with black in *taprobana*, whereas they are yellow in *hippo*. This does not apply to Ceylon specimens, as, in my experience, almost 25 per cent. show no signs of this black edging. The width of the black border to the hind wing below is extremely variable, and specimens in which this border is narrow (viz., *A. vacans*) seldom show any black edging to the veins. All varieties fly together.

I had been collecting in Ceylon for twenty-seven years before I caught a specimen of this butterfly. In May, 1916, I saw a fair lot of males while travelling from Galle to Tangalla. After entering the dry zone east of Tangalla I saw no more, although species of *Capparis*, which is said to be its food plant, are plentiful between Tangalla and Hambantota, and much scarcer further west. It continued to be plentiful at Tangalla till, at any rate, the end of October, and I also received specimens from Kandy in September and October. It was fairly common round Galle in July, 1918, especially at Gintota, where I saw numbers flying round a tree of *Crataeva roxburghii*.

"Thirty years ago plentiful in and round Colombo" (F. M. Mackwood).

172. *HEBOMOIA AUSTRALIS*, De N.; *Hebomoia glaucippe*, M.; *Hebomoia glaucippe australis*, B. & E.—Also found in Southern India, but is only a race of *H. glaucippe*, from which it differs in having no inner black border to the orange patch on the fore wing. Females in the wet season sometimes show this black border fairly well, and the ground colour of the upper side is then pale greenish-yellow instead of white.

It is very common in the low-country, especially in the drier regions. Single specimens apparently "flight" all the year round, and may be seen at the highest elevations. These fly very fast and seldom settle, so are almost impossible to catch. The largest flight I ever saw was in November, 1912. From south of Maho to Ambanpola, on the Northern line, the train passed for nearly half an hour through a swarm of many thousands.

In the dry low-country the males settle in numbers on wet patches on the roads, in river beds, &c., and are easy to catch. The females may be taken at flowers. When settled the resemblance to a dead leaf is very striking.

173. *HUPHINA PHRYNE*, M.; *Huphina nerissa evagete*, E.; *Huphina nerissa* var. *phryne*, B.; *Huphina nerissa*, De N.—Moore also gives *H. zeuxippe* from Ceylon, but this is only a pale variety, which I have taken at Haldummulla and in the north of the Island. It is probably a dry season form.

Evans does not give *nerissa* as found in India. He gives the race *phryne* from Nepaul and Assam, and *evagete* for the rest of India and Ceylon. Bingham gives *nerissa* for Nepaul, Assam, and Bengal, and var. *phryne* from Nepaul, Bengal, Southern India, and Ceylon.

It is very plentiful in the low-country, especially in the drier parts, and may be seen settled in hundreds on mud or wet sand. It flights at least twice a year, and is then common everywhere in the hills. I have seen it in swarms at Nuwara Eliya. I have not yet, however, observed it in the Galle District.

174. HUPHINA REMBA, M.; *Huphina nadina remba*, B.; *Huphina nadina cingala*, E.—Evans gives our Ceylon race as distinct from *remba* of Southern India. Bingham says: "Ceylon specimens differ in the relative width of the black markings, and in the general paleness and dull tint of the greenish-yellow on the under side." Among the few specimens that I possess there is great variation in both respects, those from Ratnapura being much larger and far brighter in colour on the under side than those from the hills of Uva. I have, however, not yet seen a female from Ratnapura. In some of my specimens of both sexes from above 4,000 feet elevation the greenish tint is entirely absent, all markings on the under side being in dull shades of brown. This is a dry season form. A specimen in Colombo Museum has the under side bright brownish-red. It is not labelled with the locality, but from its size and brightness of colouring is evidently from the wet zone.

It is usually a great rarity. In February and March, 1902, it appeared in fair numbers on the bridle road from Haldum-mulla to the Horton Plains and at Ohiya (6,000 feet). In March, 1906, I found it plentiful at the Amherst gap, Uda Pussellawa, but every specimen was worn. On these two occasions the females seemed almost as common as the males. They flew slowly and settled frequently, so were easy to catch. The low-country form, on the other hand, is said to be very hard to catch, and females are extremely rare.

"Found in Upper Pundaluoya and the higher parts of East Matale. A rarity, especially the female" (F. M. Mackwood).

175. NEPHERONIA CEYLONICA, M.; *Pareronia ceylonica*, B. & E.—Also found in Southern India.

Moore divides it into *ceylonica*, *fraterna*, and *spiculifera*. Bingham says it differs from *pingasa* in having the black border of the hind wing of even width throughout, not narrowed towards the tornus.

Both sexes are very variable, and extreme forms of the male are very distinct. These are named by Moore—

1st, ceylonica.—The terminal margin of the fore wing is very slightly concave, if at all. It has a very broad black border, with only a few minute, or no, blue spots on it.

2nd, spiculifera.—Smaller and of a paler blue. The termen of the fore wing more falcate, and the hind wing proportionately smaller. The black border of the fore wing is much narrower, especially near the tornus, and there is a series of small elongated blue spots on this border that in interspace 3 being shifted inward, and the two in interspace 1 almost or quite joined to the ground colour. As Moore points out, *ceylonica* appears to be nearest to *pingasa* and *spiculifera* to *hippia*. His variety *fraterna* appears to be an intermediate form.

Ceylonica is common in the drier low-country, but is found at all elevations during the flights, but I have only taken *spiculifera* in the hills. Both are variable, and it is easy to grade them.

Personally I believe *spiculifera* to be the cold season (or high elevation) form, while *fraterna* and *ceylonica* are the dry and wet season forms respectively of those bred in the low-country. Indian writers all agree in regarding *pingasa* and *hippia* as distinct species, and it is curious that varieties of our Ceylon race should almost grade into each of them. An analogous case is that of *Terias læta* and *venata*, the former of which is allied to the Ceylon *T. rama* and the latter to *T. cingala*, and yet there can be little doubt that *rama* and *cingala* are only varieties of our Ceylon race.

The females vary greatly in the width of the blue markings on the upper side and the amount of black shading below. In June, 1916 and 1917, I got specimens at Wellawaya, which were very exceptionally dark both above and below; in fact, all flying there then were of this unusual colour. The males with them seemed to be normal specimens of *ceylonica* above, but had more black shading below. I have received a similar pair from Kandy. These dark varieties of the female are good mimics of *D. septentrionis*. Normal varieties mimic *D. limniace* and *aglea*, but especially resemble *R. exprompta*, which, however, is not found in the usual haunts of *Nepheronia*.

They usually fly among thorny bushes in the low-country, and are not easy to catch. They are often seen at Haldummulla when "fighting," but are seldom caught, as they go fast and straight and seldom settle. The mimicry of the females also prevents recognition until too late.

Var. ceylonica is very common in the low-country of Uva and at Anuradhapura, but becomes scarcer further north. I have seen single specimens at Galle and Nuwara Eliya. It is not rare at Ohiya during the flights. *Var. spiculifera* is much rarer, and I have only seen it above 4,000 feet.

PAPILIONINÆ.

176. ORNITHOPTERA DARSIVS, M. & E.; *Papilio darsivs*, B.; *Troides darsivs*, De N.—Peculiar to Ceylon.

It differs from Indian species in having the yellow area on the lower wing more restricted. It varies to a certain extent in this respect, but all my specimens of both sexes have the apex of the cell yellow. One male in the Colombo Museum collection has the whole cell black, but I believe this variety is very rare. In a few cases the male has black spots in the yellow interspaces. One of mine has four of these spots, one each in interspaces 2, 3, 5, and 6, and the yellow in 7 is exceptionally small, the reduction being apparently caused by a spot coalescing with the basal black area. I have two others with a spot in interspace 2, and the Colombo Museum has one with spots in 2 and 3. This variety has been named *cambyses*; it is far from common.

It flies all the year round at Haldunmulla, and is apparently common everywhere up to 6,000 feet elevation at least, except in the Northern Province, the furthest north that I have taken it being at Puliyankulam resthouse. It usually flies very high, but frequently visits flowers, and it is then easy to catch.

177. MENELAIDES HECTOR, M. & E.; *Papilio hector*, B. & De N.—Also found in India.

It is very plentiful all over the low-country, but especially so in the drier districts. Single specimens visit the hills all the year round, but their flight is usually fast and straight, and they seldom settle. In the low-country they fly, as a rule, close to the ground, visiting flowers, and are very easy to catch. In November, 1914, I saw a fair number far out to sea, off the Indian and Ceylon coasts, several of which came on board the ship. At Kankesanturai, on the north coast, I have often noticed its gregarious habits when roosting for the night, a dozen or more settling on a single palmyra leaf.

The female is much more difficult to procure in good condition than the male. It can be distinguished by the much duller colour of the crimson spots and the greater amount of black on the upper surface of the abdomen.

"Female difficult to get in perfect condition on account of being incessantly harassed and damaged by the males" (F. M. Mackwood).

178. *MENELAIDES JOPHON*, M. & E. ; *Papilio jophon*, De N. & B.—Peculiar to Ceylon, and confined to the wet zone.

I have taken it at Elpitiya and Kottawa in the Galle District, and single very battered specimens at Kegalla and Rambukkana. The latter place is, I imagine, quite its most northern limit. I am told that it is quite common at times at Ratnapura and at Udagama and Deniyaya in the Southern Province. I have noticed very little variation, except in size.

It is very easy to catch in the early morning or late evening, but it flies very high in the middle of the day in fine weather.

"Has been captured at Pussellawa and Galboda in Ambegamuwa" (F. M. Mackwood).

179. *MENELAIDES CEYLONICA*, M. ; *Papilio aristolochiæ*, B. & De N. ; *Menelaides aristolochiæ ceylonicus*, E.—Peculiar to Ceylon, but is at the most only a race of the Indian *aristolochiæ*.

Bingham says : "Var. *ceylonica* has a white spot at the apex of the cell of the hind wing." The great majority of Ceylon specimens show this spot, but others without it are not very rare, and are widely scattered in different localities in both the wet and dry seasons. I have one specimen, a female, from Giant's tank, Mannar, which not only has no white in the cell, but the white spots do not commence till at least 4 mm. below it. These spots are much reduced in size, the one in interspace 5 being almost obsolete. The black on the upper surface of the abdomen is much reduced. It answers to Bingham's description of the dry season form of *aristolochiæ*. It was caught in July (dry season). It seems to me, therefore, that the race *ceylonica* is hardly well established yet.

It is very common at Haldummulla all the year round, and is well distributed all over the Island from Galle to Jaffna, though it is less common in the north than in the south. Its

flight is slow, and it settles frequently at flowers, so it is easy to catch. I have never noticed it "fighting."

I have seen a full-sized specimen killed and carried off for a short distance by an Asilid fly.

180. *PAPILIO DEMOLEUS*, De N., B., & E.; *Orpheides erithonius*, M.—Found also in Arabia, Persia, India, Burma, China, &c.

It is common all over the low-country, from Galle to Jaffna, and occasionally joins the flights in great numbers, and may then be taken at the highest elevations.

The colour seems to be much affected by the sun or age, as specimens of a rusty orange are very plentiful all over the low-country, though I have never seen one over 3,000 feet elevation. These specimens will almost invariably be found to be much worn. An extraordinary aberration captured by myself on the Wellawaya-Hambantota road is figured and described in "Spolia Zeylanica," Vol. IX., Part XXXIII.

The larvæ may be found on orange and lime trees, and are very like those of *romulus*, *parinda*, and *mooreanus*, which are found on the same trees. According to Fryer ("Spolia Zeylanica," Vol. VII., Part XXVIII.), they may be distinguished as follows :—

A.—Fourth and fifth segments markedly swollen :

a1.—Diagonal bands on segments 8 and 10 mainly brown, and meeting in the dorsal middle line = *mooreanus*.

b1.—Diagonal bands mainly white, not meeting in middle line = *parinda*.

B.—Fourth and fifth segments not markedly swollen :

a2.—Caudal tubercles white, much reduced = *romulus*.

b2.—Caudal tubercles brown, size moderate = *demoleus*.

181. *CHARUS MOOREANUS*; *Charus helenus*, M.; *Charus helenus mooreanus*, B. & E.; *Papilio mooreanus*, De N.—Peculiar to Ceylon.

It differs from the Indian *C. helenus* in having a complete series of seven sub-discal blue lunules on the under side of the hind wing, but the two in interspaces 3 and 4 are sometimes nearly obsolete. The number of red lunules visible on the upper surface of the hind wing varies from 1 to 5 in my specimens.

It is only found where there is a fairly heavy rainfall. It is very plentiful in the jungles between Haputale and Ohiya (4,000 to 6,000 feet), and occasionally descends as low as Haldummulla, but it is very rarely seen below 3,000 feet in Uva. In wetter districts it is found at very low elevations, and it has been taken at Kottawa, near Galle. It is common at Ratnapura, Madampe, and Deniyaya.

The female seems to be very rarely captured. I have only one specimen, which I bred. It differs from the male in having the inter-nervular yellow streaks on the fore wing much more clearly marked, as they are formed by scales in the ♀, and by hairs in the ♂. It also differs in having the white patch on the lower wing the same size both above and below, in the ♂ this patch is much smaller on the under surface than on the upper. The males are fond of settling on wet patches on the roads or in the beds of streams.

“Generally plentiful in heavy jungle land, especially in the Matale hills” (F. M. Mackwood).

182. ILIADES PARINDA, M.; *Papilio parinda*, De N.; *Iliades polymnestor parinda*, E.; *Papilio polymnestor parinda*, B.—Peculiar to Ceylon, but is a race of the Indian *I. polymnestor*. The male differs from *polymnestor* in the greater area of the blue on the upper side. The female differs in having the blue area tinged in spots, or sometimes even entirely replaced by pale buff. The last form is by far the rarest.

It is a most variable insect. In the male the width of the blue band on the fore wing varies greatly, and the post-discal spots on the hind wing may be large and conical, as in *polymnestor*, or small and round. In the female these spots are sometimes very much reduced, and the two upper ones may be entirely obsolete.

It is very common at Haldummulla, especially during the south-west monsoon (viz., the dry season). I have seen it all over the low-country as far north as Mankulam, and I found it once in extraordinary abundance at Anuradhapura in December. The male is very fond of settling on the sand in river beds and on wet roads in the hot weather. The female is easiest to catch when laying her eggs.

183. *LÆRTIAS ROMULUS*, M.; *Papilio polytes*, B. & De N.; *Lærtias polytes romulus*, E.—Evans says: "Jordan confines *polytes* to China, giving the Indian race as *romulus*."

As is well known, there are three varieties of the female: 1st, like the ♂; 2nd, mimics *M. aristolochiæ* ♀; and 3rd, mimics *M. hector* ♀. The first has been named *cyrus*, the second *polytes* or *stychius*, and the third *romulus*. The one which mimics *aristolochiæ* has usually in Ceylon a white spot in the cell (like the race *ceylonica*), but sometimes the white patch does not commence till well below it. The one which mimics *hector* is, as might be expected, a far better mimic of the female *hector* than of the male, though it is sometimes compared with the latter in articles on mimicry. It has been suggested that the crimson bodies of *aristolochiæ* and *hector* would spoil the mimicry, but in the females of both almost the whole of the upper surface of the body is black, and the abdomen is so carried in flight that the crimson would be quite invisible when viewed by a bird from above.

It joins the flights in great numbers, especially in November and December, and I have noticed that in these flights the variety which mimics *hector* is the commonest. At Haldummulla *hector* is far less common than *aristolochiæ*, but these flights were coming from the dry low-country, where the opposite is the case. When the flights are not on, the variety, like *hector*, is by far the rarest at Haldummulla, and the one like the male is the commonest.

The males may often be found settled on mud or wet sand. The females visit flowers, but are best caught when laying their eggs. They are very easy to breed, but occasionally remain for a long time in the pupal stage. Last year I had six larvæ which pupated in May. Three hatched out early in June, one at the end of July, one in the middle of August, and the last in September. The larvæ are usually to be found on orange and lime trees, but I have often seen the females laying their eggs on *Todalia aculeata*. I have bred a fair number, but have not yet lost a single larva through parasites, and I imagine their numbers must be mainly kept in check by birds.

184. *CHILASA LANKESWARA*, M. ; *Papilio lankeswara*, De N. ; *Papilio clytia lankeswara*, B. ; *Chilasa clytia*, with var. *lankeswara* and dimorph *dissimilis*, E.—Moore gives *dissimilis* and *clytioides* as separate species.

I think it is certain that there is only one species in Ceylon, but I do not feel competent to express an opinion as to whether it is a variety of *clytia*, as given by Evans ; a race, as given by Bingham ; or a sub-species, as given by De Niceville. All the later writers agree that *dissimilis* is only a dimorph.

Rothschild says that *lankeswara* “differs from *P. clytia* in the umber brown colour of the wings, and in the small sub-marginal spots of the fore wings This sub-species has been described from slightly aberrant specimens, in which the sub-marginal spots of the fore wings are partly obliterated ; in most individuals the series of these spots is complete, and on such specimens Moore’s *clytioides* is based.”

I have only a rather poor series, but they vary much in the number and size of these spots and of the discal sagittate spots on the hind wing. The umber brown colour seems constant.

C. lankeswara is a mimic of the *Euplaeas*, and it is curious that these, in Ceylon, differ from their corresponding Indian species in the same way that *lankeswara* differs from *clytia*. The form *dissimilis* mimics *D. limniace* and *aglea*, and is said to agree with Indian specimens. It varies greatly in size and the amount of the white markings. In both forms the females can be distinguished by their broader and more rounded fore wings.

It has as rapid a flight as any *Papilio* in Ceylon, but does not always make use of its powers. When visiting flowers, or hovering over wet patches on the roads, its flight is slow, and so like that of a *Danaïs* or *Euplaea*, that after thirty years’ experience I am still sometimes deceived by it. I imagine that protection is most needed by the female when laying her eggs ; she would then probably be hovering slowly over the cinnamon, &c., and her mimicry would be most advantageously displayed. The pupa is a most wonderful example of camouflage. It is fixed to a branch so as to exactly resemble the end of a broken twig, and I have found it difficult to distinguish even in a breeding cage.

I have found *dissimilis* rather more plentiful than *lanke-wara*, but neither form is common. The best localities I have noticed are the road from Wellawaya to Muppane and Dambulla. I have also taken it at Haputale (5,000 feet), Haldummulla, and Galle, but have not yet seen it in the Northern Province.

185. *PAPILIO CRINO*, B. & De N. ; *Harimala montanus*, M. ; *Achillides crino fruhstorferi*, E.—*P. crino* is found in India. Evans gives *fruhstorferi* as the Ceylon race. Bingham says : “ *var. montanus*, Felder, was founded on specimens devoid of the cottony scent streaks on the upper side of the fore wing.” These streaks are present in the male in a fair proportion of Ceylon specimens, but those without them are usually the commoner.

It is especially abundant in the low-country of Uva and the North-Central Province, but is common everywhere in the low-country, except in the extreme north. I have seen it once in the Mannar District. Individuals which are apparently “fighting” appear all the year round in the hills. I once saw a very big flight at Galle in March, the direction was south-west, viz., straight out to sea. It continued for three or four days, and enormous numbers must have perished in the sea.

The male is often to be found settled in numbers in the sandy river beds, and is very easy to catch. The females are not easy to procure in good condition. They can be distinguished by the narrower green band on the fore wing, and there is also usually a diffuse orange spot near the apex of the hind wing above.

“Abundant in Kandy and Kurunegala jungles” (F. M. Mackwood).

186. *PATHYSA ANTIPHATES*, M. ; *Papilio alcibiades*, De N. ; *Papilio antiphates alcibiades var. ceylonicus*, B. ; *Pathysa antiphates ceylonicus*, E.—*P. antiphates* is found in India, Burma, Siam, Malaya, China, &c. The range of the various races is still unsettled.

Rothschild describes *ceylonicus* as having “Two basal black bands on the upper side of the fore wing extending beyond the median nervure ; the fourth band broad and reaching to the median nervure (not triangular).” This I consider merely

a seasonal variety. In two of my specimens from the dry zone this fourth band does not reach the median nervure, and is triangular; those from the wet zone agree with Rothschild's description. The specimens in the Colombo Museum vary much in this respect, and in one the band is very acutely triangular; unfortunately it has no label of locality. It is so rare and so variable in every respect that it is difficult to say whether it is a local race or not, but dry zone specimens seem to agree approximately with Bingham's description of *alcibiades*.

The only place where I have personally taken it is at Sirigalla, near Muppane, in the low-country of Uva. I found it settled on wet sand in the bed of a stream. A native catcher has brought me specimens from Ratnapura, Kottawa, and Deniyaya. All my specimens are males.

"Found in the Ratnapura District February to June and October to December" (F. M. Mackwood).

187. *PATHYSA NOMIUS*, M. & E.; *Papilio nomius*, De N. & B.—Also found in India.

This is usually rare in Uva, but it occasionally appears in great numbers at the commencement of the north-east monsoon. In October, 1893, I found it in hundreds settled on the wet roads near Wellawaya, and I have heard of two similar swarms in the same district since. It joins in the flights, and I have notes of its occurrence above Haldummulla at an elevation of 5,000 feet. I have also seen it in great numbers on the road from Trincomalee, to Dambulla, and have received specimens from Kandy.

It varies a great deal in the width of the black markings, dry season forms being much lighter than those taken during the rains. I have not yet obtained specimens from the wet zone, though it is found there.

"Numerous on roads to Trincomalee. Caught at Kottawa" (F. M. Mackwood).

188. *ZETIDES DOSON*, M. & E.; *Papilio jason*, De N.; *Papilio eurypylus jason*, B.—Evans gives *doson* as peculiar to Ceylon, and *eleius* as the Southern Indian race; Bingham and De Nicéville give *jason* from both Ceylon and Southern India. Moore divides our Ceylon race into *doson* and *telephus*. He

says that *doson* "differs from *Z. telephus* in being larger, the transverse medial macular band much narrower in both wings. On the under side the medial band is also narrower, especially across the hind wing . . . , the outer black spots to the discal band are larger, and less bordered with carmine." Extreme specimens are fairly distinct, but they vary, and it is easy to grade them. I consider the difference is seasonal. In March, 1917, I took *telephus* at Wellawaya after two months' drought, and *doson* in May after heavy rains.

It is extremely plentiful at times all over the low-country, except in the extreme north, and I have taken it from Kottawa to Vavuniya. It sometimes "flights" in great numbers, and on rare occasions these flights visit the hills, and specimens may then be taken at any elevation. The males settle in crowds on wet patches on the roads and in river beds, and a dozen or two may be covered at one stroke of the net. The females seem to be very difficult to obtain, and I have not yet succeeded in capturing a single specimen.

189. DALCHINA TEREDON, M.; *Papilio sarpedon teredon*, B.; *Zetides sarpedon teredon*, E.—Also found in Southern India.

It differs from *sarpedon* in the narrower medial band across both wings, and in the upper portion of this band, on the fore wing, being of a more distinct greenish shade. The width of the band varies in Ceylon specimens, but the greenish tint is usually very pronounced; in one of my specimens, however, it is almost indistinguishable.

They may be seen day after day in the same place flying very fast round the tree tops, generally in pairs, but are then extremely hard to catch. The females occasionally visit flowers, but I have found it very difficult to get specimens in good condition. The males are much addicted to settling on wet roads, but are not gregarious like *doson*; usually there is only one on the wet patch, and to find more than two is extremely rare.

They are very plentiful at Haldummulla all the year round, and I have found them common at Kottawa, near Galle, and at Ohiya (6,000 feet). They become much rarer in the drier districts, and I have not yet seen a specimen in the northern half of the Island. They do not join in the flights.

"I have seen six or more together on wet patches on several occasions. Fairly plentiful in the Central Province hills" (F. M. Mackwood).

190. ZETIDES AGAMEMNON, M.; *Papilio agamemnon*, De N. & B.; *Zetides agamemnon menides*, E.—*Z. agamemnon* is found in India, Malaya, China, &c., The race *menides*, which only differs in the greater length of the tails, is restricted to Southern India and Ceylon.

It is common all over the low-country, but especially so in the south. Not rare in the hills at times, and, as a rule, does not appear to be "fighting," as the direction of flight is seldom constant. In November, 1917, however, I saw it at Pattipola in great numbers, and on this occasion it was certainly "fighting," as all were flying due south.

It is most frequently caught when visiting flowers. It only stops a very short time at each blossom, so is not easy to capture. Occasionally the males may be taken settled on the mud near cattle sheds or lines.

"Fairly plentiful everywhere. Larva feeds on the soursop leaves" (F. M. Mackwood).

HESPERIIDÆ.

This group of butterflies are not, as a rule, showy, and therefore they have been less studied than the others. From an economic point of view, however, they are the most important group in Ceylon, as at least four species feed on paddy, two on coconut palms, two on ginger, one on sugar cane, &c. The literature is rather meagre, as they were not dealt with in De Niceville's work, and have not been reached in the Fauna of India series. The leading work is still "A Revision of the Oriental Hesperiidæ," by Messrs. Elwes and Edwards (Transactions of the Zoological Society of London, Vol. XIV., Part 4). Unfortunately the authors had apparently few Ceylon specimens to examine, and I fear, therefore, that several of our species will require re-naming.

This work mainly decides questions of specific identity by an examination of the prehensores of the males, and the authors point out "that a very considerable practice in

making this examination, and great experience in estimating the value of the characters observed, are necessary to form an opinion on the subject." I confess that I have had no previous experience, but the sketches in the plates herewith are in nearly every case the result of the examination of a large number of specimens. In no case was the sketch made from a single specimen. I am sending a set of my slides to the Colombo Museum, where any one interested can examine them. They include all the Ceylon Hesperidæ, with the exception of *C. spilothyrsus* and *G. albofasciata*. When removed from the body and allowed to dry, the clasps almost invariably shrivel and curl up, thus entirely altering their outlines as seen under a microscope. I have, therefore, whenever possible, used perfectly fresh, undried specimens for my sketches.

In cases where there are only slight differences between the prehensores of two forms, it is necessary to examine a large number of each, to ascertain if these differences are permanent, or only casual variations. For instance, with regard to *Padraona dara*, Messrs. Elwes and Edwards write that "Mr. Edwards dissected fifteen specimens from different localities, and found considerable variation in degree, but no differences which can be regarded as specific." Lieutenant-Colonel Evans, in his Notes on Indian Butterflies (Journal of the Bombay Nat. Hist. Society, Vol. XXIII., p. 808), says that he examined twenty-three males in his collection, and found that he had five species. I have dissected well over a hundred Ceylon specimens, and find two very distinct forms, which show no signs of grading, and *extremely slight internal variation*. (See Pl. 5, figs. 3, 4, 5, and 6). I believe there is also a third form, but I have been unable, so far, to obtain sufficient specimens to prove that it is not merely a variety or seasonal form. (See Pl. 5, figs. 7 and 8). By the courtesy of Mr. F. Hannyngton, I.C.S., I have been able to dissect a few specimens from Coorg, and found two forms among them, which are quite distinct from anything I have seen in Ceylon. Apparently this group is split up into numerous local races, and, so far as my experience goes, the prehensores will be found a more constant and reliable means of separating them than the colouration of the wings. Similar

local races apparently also occur in the *phillippina* and *kumara* groups of the genus *Parnara* and others.

A question which arises is whether differences in colour caused by climatic influences are accompanied by changes in the prehensores. This, of course, can only be settled by breeding experiments. For instance, Indian writers treat *Caprona saraya* as a seasonal form of *C. ransonnettii*, though Elwes and Edwards point out that their clasps differ considerably. In Ceylon *C. siamica* shows an almost similar divergence from *C. ransonnettii*, and would therefore, I presume, be regarded as a seasonal form. I have examined over a dozen specimens of *C. siamica*, and have, so far, found no signs of grading in the clasps, and am therefore inclined to regard it as distinct. (See Pl. 3, figs. 9, 10, 11, and 12.)

To satisfactorily settle the status of our Ceylon species and races, it will be necessary to examine a large number of allied Indian forms, especially from Southern India, and I shall be very grateful to any Indian collectors who may send me specimens for dissection.

In describing external markings, Elwes and Edwards use a different nomenclature for the parts of the wing from that given in Plate 1. For instance, they call the vein next below vein 2 vein 1a, and the interspace between this vein and vein 2 cell 1a. To avoid confusion I have continued to use Bingham's terms, and call the former vein 1, and the latter interspace 1.

My attention has been called to the fact that Moore's *Lepidoptera Indica* is now the leading work on this group. The price (£80), however, places it beyond the reach of most collectors.

191. HANTANA INFERNUS.—Peculiar to Ceylon.

This is a very variable species. In my lightest marked specimen the markings on the upper side of the fore wing consist of two minute pre-apical yellow spots. In the most heavily marked there are three pre-apical spots, one spot in the cell touching the pre-costal vein, and a smaller one below it, and a small one in the centre of interspace 2. Some specimens have a minute spot on the costa, above the spot in the cell; Moore says these are females; all I have seen were

males. The upper side of the hind wing is usually uniformly black, but sometimes the terminal half is irrorated with golden yellow scales shaped like a sword blade; these are grouped between the veins, forming a row of post-discal diffuse spots. On the under side of the fore wing, in addition to the pre-apical spots, there is sometimes a straight row of five spots, viz., three from the costa to the middle of the cell, a round spot in interspace 2, and a smaller one below in interspace 1. There is also occasionally a large very diffuse spot at the apex of interspace 1. On the hind wing some specimens have complete discal and post-discal rows of very diffuse orange spots; in others all these spots are absent. When present they are formed by sword-shaped scales as above.

It is usually found in jungle from 2,000 to 6,000 feet elevation, and settles with its wings spread out flat on the under side of a leaf; if disturbed it seldom flies far. It is very active in the net, and the wings rub easily, so perfect specimens are not easy to procure. I have not yet seen a female.

It is plentiful at Haputale, and not rare at Haldummulla, and occurs at all times of the year. I have also specimens from Kandy and the hills above Ratnapura. For prehensores, see Pl. 3, figs. 1 and 2.

"Kandy District, Matale hills at 5,000 feet, parts of Kotmale, and in the Ratnapura hills" (F. M. Mackwood).

192. *CELENORRHINUS SPILOTHYRUS*, E.; *Plesioneura spilo-thyrus*, M.—Also found in Southern India.

Evans says: "*C. fusca* can easily be separated from *spilo-thyrus* by the chequered cilia." In several of my specimens the cilia of the hind wing are distinctly chequered. Elwes and Edwards point out that in *C. fusca* the costal spot "is usually, but not always, white," whereas in Ceylon specimens "it seems to be always yellow." Moore says this spot is white in the male, and yellow in the female. He may be right. In every specimen I have seen it was yellow, though varying in depth of colour, but I have never seen a male from Ceylon.

It varies greatly in the size and shape of the spots on the fore wing, and one or both of those in interspace 1 are often missing. The definition of the golden-yellow spots on the hind wing is very variable, and they may be entirely obsolete

below. They are formed by sword-shaped scales identical with those of *H. infernus*, but, when especially well marked, there is also a mixture of broader scales.

It is found in the same localities, and has the same habits as *H. infernus*, but, whereas the female of *infernus* seems unprocurable, in *spilothyrs* the opposite is the case, and I have not yet seen a male. This, coupled with the resemblance in habits, venation, and scaling, gives rise to a suspicion that *infernus* is the male, and *spilothyrs* the female, of our Ceylon form. Of course, this can only be proved by breeding.

My specimens are from Haldummulla, Haputale, Kandy, and the hills above Ratnapura.

"Occurs in jungles about 3,000 feet elevation, mostly July to September" (F. M. Mackwood).

193. *SARANGESA ALBICILIA*.—Peculiar to Ceylon, but probably a race of *S. dasahara* of India. It only differs in having the under side of the hind wing white. The prehensores seem to be identical. (See Pl. 4, figs. 1 and 2.)

It varies little. On the fore wing the discal spot in interspace 2 is sometimes obsolete. On the under side of the hind wing there is sometimes a complete series of diffuse black marginal spots in interspaces 1 to 5, in other specimens there is no trace of these.

In May, 1917, it was apparently "fighting" at Haldummulla, and I caught a fair number of specimens. The direction of flight was west. It is usually a rarity here, but is very common in the low-country of Uva. I have taken it at Trincomalee in November, and have received specimens from Kandy taken in August.

"Numerous in the Kandy-Matale heavy chenas" (F. M. Mackwood).

194. *COLADENIA TISSA*, M.; *Coladenia indrani*, De N.; *Cnaisolade indrani tissa*, E.—Probably a race of *C. indrani*, which is found in India and Burma. Elwes and Edwards distinguish *tissa* from *indrani* by the "distinct displacement inwards of the middle one of the three pale spots which form the sub-apical series." In my specimens these spots vary in number from 2 to 5, though 3 is most usual. The spot in 7 is usually displaced inwards, but the displacement is sometimes

very slight. All other markings and the ground colour are also extremely variable. I have only been able to examine a single specimen of *indrani* from Coorg. In it the three pre-apical spots are equal in size, and are far larger than in any specimen of *tissa* that I possess. They are arranged in a straight line. The clasp differs slightly from that of *tissa*, but this cannot be relied on with the examination of only a single specimen. For the prehensores of *tissa*, see Pl. 3, figs. 5 and 6.

It is very widely distributed in Ceylon, but I have never found it common. I have taken it at Haldummulla, Wellawaya, Hambantota, Galle, Kegalla, and Vavuniya, and have specimens from Kandy. It settles with its wings spread out flat on the under side of a leaf, and, as a rule, does not fly far if disturbed; but its flight is so rapid that it is not always easy to see where it settles.

"Captured at Jaffna in August; found at Badulla" (F. M. Mackwood).

195. *TAGIADES DISTANS*, M. & E.—Also found in India, but is probably a race of *obscurus* from Java. Moore says: "*Obscurus* differs in the absence of the discal semi-transparent spots on the fore wing." Elwes and Edwards say they have not been able to compare Malayan with Ceylon specimens, but regard the distinction as of no value, as these spots are often missing in Ceylon specimens. Males without them are not at all rare, but all the females in my collection show them. I have received three specimens of an allied race from Mr. F. Hannyngton, I.C.S., Coorg. I am uncertain whether they are *obscurus* or *alica*. They differ in many ways from Ceylon specimens, but especially in the markings on the under side of the hind wing. The clasp is distinct, though clearly allied. The clasp of *distans* is figured on Pl. 3, fig. 7.

It is common from sea level up to 5,000 feet at least, wherever there is a fair rainfall. It flies all the year round, but is most abundant at Haldummulla, near the changes of the monsoons.

On the roads at Haldummulla large skippers are often met "fighting" west. When approaching they are inconspicuous, but when going away they show a lot of white. These flights

are, I believe, almost entirely composed of *T. distans* and *atticus*, but one specimen I succeeded in catching proved to be *U. folus*. In May, 1917, they were exceptionally numerous, and all I caught, or saw settled, were *T. distans*. When not fighting, it only flies a short distance, and settles with its wings expanded, usually on the under side of a leaf, but often in the most conspicuous positions.

“Has a wide range, from Colombo to Nuwara Eliya” (F. M. Mackwood).

196. *TAGIADES ATTICUS*.—Also found in India, Burma, Malaya, Dutch Indies, &c.

This is a very variable species; as a rule, specimens from Kandy, Ratnapura, and other places in the wet zone are much smaller, and have less white, than those from the highest elevations. The marginal spots on the hind wing vary greatly in size, but the one at the end of vein 1 is usually the largest. The black spot in the cell on the under side of the hind wing is frequently missing. In my series the number of hyaline spots on the fore wing varies from 5 to 10, the lowest one in the cell, and those in interspaces 2 to 5 being sometimes obsolete. The clasp is figured on Pl. 3, fig. 8. I have noticed no variation in it so far, but have only been able to spare specimens for dissection from Kandy and Ratnapura (wet zone).

It is much rarer at Haldummulla than *distans*, and far harder to catch, as it seldom seems to settle here. It is commoner at Haputale (5,000 feet), and I am told that it is abundant in Nuwara Eliya at times. I can get plenty from Kandy.

“An up-country species, from Kandy upwards” (F. M. Mackwood).

197. *TAPENA THWAITESI*.—Also found in India, Burma, Malaya, &c.

Elwes and Edwards divide this genus as follows:—

- “ 1. Upper lobe of clasp bifid at the apex = *thwaitesi*.
- “ 2. Upper lobe of clasp not bifid at the apex.
- “ 3. Upper lobe of clasp with three limbs, all of which are serrate. Similar to *thwaitesi*, but smaller and paler above = *minuscule*.

" 4. Upper lobe of clasp with two limbs, of which the lower is serrate and the upper simple. Size of *thwaitesi*, but upper side in the male nearly uniformly umber brown = *hampsoni*."

Swinhoe groups them all as one species, as the only differences are, he considers, in the genitalia, and it seems probable that they will eventually be only classed as local races of *thwaitesi*.

As might be expected, the clasp of the Ceylon form is nearest to that of the Southern Indian one, viz., *hampsoni*. See Pl. 3, figs. 3 and 4. The sole difference appears to be the slight serration of the upper limb of the clasp. This is present in the four specimens that I have dissected, but almost disappears when the clasp dries up. The name *thwaitesi* was originally given to a specimen from Ceylon, so that name would, I presume, stand for our form in any case. Externally my specimens of both sexes closely agree with the description of *hampsoni*. The clearness of the dark markings in the male is very variable.

A great rarity, and I have never personally caught a specimen. A native collector has sent me specimens from Kandy, Deniyaya, and Kottawa, and I saw Mr. Mackwood catch one at the latter place in February.

"Found at Kandy February to August, and Ratnapura January to April and October" (F. M. Mackwood).

198. CAPRONA RANSONNETII, E.; *Abaratha ransonnnettii*, M.—Also found in India.

This is a variable insect. The hyaline spots on the fore wing vary much in size and shape, the two in interspace 1, and the one at the upper margin of the cell being often nearly obsolete. In all my males there are three pre-apical spots, but the females sometimes have four or five. Some specimens have a faint marginal row of pale spots, with a sub-marginal row of more conspicuous ones in interspaces 4, 5, 6, and 7, thus disagreeing with Elwes and Edwards' classification of the species. The markings on the under side are very variable.

It is fairly common at Haldummulla during the south-west monsoon (dry season), but becomes much more abundant at a lower elevation, and I have taken it all over the low-country

of Uva and at Trincomalee and Vavuniya. The males are most frequently found settled on the wet sand in river beds or on wet roads; the females visit flowers, and seldom fly far if disturbed.

The clasps are figured on Pl. 3, figs. 9 and 10.

"Common in the low-country up to Jaffna" (F. M. Mackwood).

199. *CAPRONA SIAMICA*.—Not mentioned in any list that I know of Ceylon Butterflies.

Elwes and Edwards, in their analytical table of the genus *Caprona*, divide the species by two important characters: 1st, the possession of "a terminal row of pale spots on the fore wing above"; and 2nd, the presence of "a hyaline spot in the cell of the fore wing above, near the middle." Neither of these help to place this species. The row of pale spots is sometimes very prominent, but in other specimens it is equally obscure. The spot in the middle of the cell is usually present, but I have specimens without it. The other hyaline spots seem fairly constant, but the large one at the end of the cell is sometimes divided into two very small ones. The pre-apical spots usually number 5, but they are sometimes reduced to 3. As a rule, the under side of the hind wing is pure white, but it is occasionally tinged with ochreous. The ring of small black spots round the disc number 10 in all my specimens. In general appearance it somewhat resembles Elwes and Edwards' figure of *saraya*. Evans thinks *saraya* is a dry season form of *ransonnettii*. If he is right, it seems probable that *siamica* bears the same relationship, as the clasps differ from those of *ransonnettii* in almost exactly the same way as those of *saraya*. See Pl. 3, figs. 11 and 12.

I found it fairly common many years ago in chenas at 1,000 to 2,500 feet elevation below Haldummulla, but I have not been able to work this country lately. It is not rare at Wellawaya, and a native collector caught fourteen specimens there at the beginning of November, 1917 (commencement of rainy season). It does not seem to settle on wet sand, like *C. ransonnettii*. I have not yet caught a female.

"A scarce fly. Caught in Kandy and Haragam January, July, August, October, and November" (F. M. Mackwood).

200. *GOMALIA ALBOFASCIATA*.—Also found in India.

A very scarce and local insect in Ceylon. It is said to be found in the jungle between Weerawella and Kirinde, in the Hambantota District. I have frequently searched for it there without success, but only in February, March, and April.

My only specimen was given to me by the late Mr. John Pole. It has no label of locality or date.

"Hambantota District in July. Found also near Batticaloa" (F. M. Mackwood).

201. *HESPERIA GALBA*.—Also found in India, Burma, &c.

This is one of the commonest skippers in Ceylon. I have taken it all over the low-country, from Galle to Jaffna, but have no records of its capture above 4,500 feet elevation. It is especially common at Haldummulla, and can be taken all the year round. Specimens from Jaffna and Mannar are usually very small.

It varies little, except in the size of the white discal band on the upper side of the hind wing. It flies low and settles on the ground or short grass, and never goes far if disturbed, so is very easy to capture.

"I have caught it at Haputale and Pattipola" (F. M. Mackwood).

202. *BARACUS VITTATUS*.—Peculiar to Ceylon.

The male varies in the size of the white patch on the fore wing, and the spots in interspaces 6 and 7 may be absent. In the female these spots are also sometimes absent, and those in interspaces 2 and 3 may be very small; the amount of white scaling on the lower wing also varies considerably.

It is exceedingly plentiful on patanas at high elevations, especially on the Horton Plains. It may occasionally be taken on grass by the roadsides as low as 3,000 feet at Haldummulla, and I found it common at Galaha, near Kandy. Those taken below 4,500 feet are usually smaller than those from the highest elevations.

For prehensores see Pl. 4, figs. 3 and 4. They bear a very close resemblance to those of *B. subditus* from Coorg.

"On the Ambegamuwa patanas" (F. M. Mackwood).

203. *SUASTUS GREMIUS*.—Found also in India, Burma, China, &c

Moore also gives *subgrisea*, and says it differs in having the three discal spots smaller, the sub-apical spots very indistinct, and the under side less gray. It is a most variable insect, but all my varieties grade perfectly with one exception. This specimen was taken on this estate. It is smaller than usual, and the ground colour above and below is much darker. The only markings above are two minute spots, one each in interspaces 2 and 3 of the fore wing. Below, in addition to these spots, there are very minute black dots in interspaces 6, 7, and 8 of the fore wing, and a small black spot in the cell of the hind wing; the discal series of black spots is wanting. This may be the insect named *subgrisea* by Moore, though he describes it as having the black discal spots below. I have only seen the one specimen. The ground colour of the under side of *gremius* seems to vary climatically, those from the hills being usually much darker than those from the low-country.

The larva feeds on palms, and the butterfly is found wherever coconuts are grown, and in some places where they are not. It is very abundant at Galle and Kurunegala, common at Pallai, near Jaffna, and not rare at Haput and Haldummulla. I have no records of its capture above 5,000 feet.

204. *SUASTUS MINUTA*, E.; *Tagiades minuta*, M.—Peculiar to Ceylon.

The prehensores are somewhat like those of *S. gremius*, the tegumen being almost identical. See Pl. 4, figs. 5, 6, and 7. They are very distinct from those of any *Tagiades* that I have examined.

It is very rare in Uva, and I have never found it common anywhere; the native collectors, however, seem to be able to get any quantity at Kandy, and they have also sent me specimens from Ratnapura and Kottawa. The few living specimens I have seen only flew a short distance, and were very easy to catch.

“Not uncommon in the Kandy District in February and in August, September” (F. M. Mackwood).

205. *IAMBRIX SALSALA*, E.; *Astictopterus stellifer*, M.—Found also in India, Burma, Malaya, Hong Kong, &c.

The male is fairly constant, but the female varies very much in the number and size of the translucent discal spots on the

fore wing. These vary in number in my specimens from 4 to 8.

It is very common in jungles or on grass by the roadsides at Haldummulla, especially during the dry season. It is plentiful in jungles near Galle, and I have also taken it at Hambantota, Anuradhapura, Trincomalee, Kandy, &c., but have no notes of its capture above 3,000 feet, or north of Vavuniya.

"Numerous in guinea grass fields, Colombo, and similar localities in July and August" (F. M. Mackwood).

206. *TARACTROCERA MÆVIUS*. — Found also in India, Burma, Borneo, &c.

Evans says: "The Ceylon form of *mævius* has not the veins on the hind wing below conspicuously pale as in continental specimens." I have not been able to compare them with Indian specimens, but my series vary considerably in this respect, and also in the size of the spots on the upper side, which are sometimes white and sometimes yellow in both sexes.

It is very abundant at Haldummulla all the year round, and I have found it plentiful on the ramparts at Galle in May. It is so small, and looks so like a fly, that it can be easily overlooked, but I fancy it is common on short grass in most districts. I have not, however, noted it yet north of Vavuniya.

207. *AMPITTIA MARO*. — Also found in India, Burma, Malaya, China, Dutch Indies, &c.

The amount of the yellow markings is variable in both sexes, but specially so in the male.

It may be seen in plenty at times in growing paddy, but I have also taken a few on the grass by the roadsides at Haldummulla during the south-west monsoon (dry season), when the paddy fields are not being cultivated. Other localities I have noted are Kandy, Galle, and Anuradhapura, and a single specimen from Giant's tank, near Mannar. It flies low and settles often, so is very easy to catch.

208. *HYAROTIS ADRASTUS*. — Also found in India, Burma, Dutch Indies, Hong Kong, &c.

The spots on the fore wing vary much in size, and those in interspaces 1 and 3 are sometimes absent. The clasp is figured on Pl. 3, fig. 8.

It is usually very rare at Haldummulla, but in July, 1900, it appeared in fair numbers in the jungle bordering this estate. They flew fast, settled rather high, and were very difficult to catch. They could, however, be found day after day in the same spot, so gave me plenty of chances. Except for a single specimen at Kottawa, I have never come across it anywhere else, so imagine it must be very local. I get plenty of specimens from the native collectors at Kandy.

"Numerous in Lady Horton's jungle at Kandy from June to December" (F. M. Mackwood).

209. *MATAPA ARIA*.—Found also in India, Burma, Dutch Indies, Hong Kong, &c.

This can be at once distinguished, when settled, from any other Ceylon skipper of the same size, by its bright red eyes, which, however, fade soon after death.

The only place I have taken it is at Hirimbura, 3 miles from Galle, in February, March, April, July, and October. As a rule, it only flies a short distance if disturbed, and is very easy to catch.

The prehensores are figured on Pl. 4, figs. 9 and 10.

"Found at Colombo and Kandy. Comes freely to flowers of white *Lantana*" (F. M. Mackwood).

210. *GANGARA THYRSIS*.—Also found in India, Burma, Dutch Indies, Philippines, &c.

Judging from my personal experience, I should consider this a great rarity in Ceylon. I have only once seen it on the wing, viz., at Kegalla. It was settled on a path in jungle with its wings closed over its back; on being approached it flew away very fast, and I did not see it again. For some years past I have asked the native collectors in Kandy to get me specimens, but without result till August, 1918, when they brought me half a dozen males. I have not yet succeeded in getting a female. Bainbrigge-Fletcher describes it as a minor pest of palms in India ("Some South Indian Insects"). The clasp is figured on Pl. 4, fig. 12.

"Found in damp jungles in several low-country districts. Females in condition quite scarce" (F. M. Mackwood).

211. *PADUKA LEBADEA*, E.; *Matapa subfasciata*, M.—Found also in India, Malaya, Dutch Indies, &c.

The figure in Moore's " *Lepidoptera of Ceylon* " is evidently drawn from a very dwarfed specimen, as, with the exception of *G. thyrsis*, it is the largest Hesperid in the Island. I have never seen a specimen alive, and the Kandy collectors were for many years quite unable to supply me with one. In August, 1918, however, it was common near Kandy, and a collector brought me a fair number, of which six were females.

The clasp is figured on Pl. 4, fig. 11.

" Found also in Colombo, Ratnapura, and Pattipola " (F. M. Mackwood).

{ 212. NOTOCRYPTA ALYSOS; *Plesioneura alysos*, M.

{ 212a. NOTOCRYPTA RESTRICTA; *Plesioneura restricta*, M.

Grouped as *Notocrypta feisthamelii* by Elwes and Edwards, but Swinhoe (" *Lepidoptera Indica* ") gives *feisthamelii* and *restricta* from Ceylon.

N. feisthamelii, or races thereof, is found in India, Malaya, China, Japan, Philippines, &c.

I agree with Moore that there are two distinct forms in Ceylon, but they may prove to be merely seasonal varieties of our local race: *1st, alysos*.—Upper side fore wing: The white band is of nearly even width throughout, and its outer edge has a fairly regular curve. Beyond this band there is, as a rule, one spot in interspace 4, but this is sometimes absent. I have seen a few specimens in which there was also a very minute spot in interspace 5. Under side: The white band is *always* continued to the costa by an opaque whitish patch. *2nd, restricta*.—Upper side fore wing: The white band broad in interspace 2, and narrower in the cell and interspace 1. White spots outside the band in 3, 4, 6, 7, and 8, and occasionally in 5. The spot in 6 is sometimes absent. *That in interspace 3 is always the largest; this spot is never present in alysos*. The white band is *never* continued to the costa below.

I have examined a great number of specimens, but so far I have seen only one exception to the rule in Ceylon, that, if the band below is continued to the costa, there are never more than two spots beyond the band, and very rarely more than one; whereas, if it is not so continued, there are always 4 to 6. The sole exception is in the Colombo Museum collection. In addition to the small spots in 4 and 5, it has two very minute

pre-apical dots in 7 and 8. I have only noticed small differences in the prehensores, the most marked being the size of the clasps. I have selected males of both for dissection approximately equal in size, and the clasp of *restricla* has invariably proved to be larger, and comparatively broader, than that of *alysos*. Elwes and Edwards describe *feisthamelii* as having a "broad white band on the fore wing, and five white spots besides," and quote Leech as saying that the band is continued to the costa below by a pale patch. If both these points are essential, typical *feisthamelii* does not, I believe, exist in Ceylon.

Both are plentiful at times at Haldummulla, though *alysos* is by far the commoner form. I have specimens of *alysos* from Kandy, Ratnapura, and Galle, and of *restricla* from Haputale and Kandy. I have bred *restricla* on *Kæmpferia rotunda*.

They are usually found in jungle, and fly rather fast up and down the paths, settling frequently. They are not at all shy, and, if frightened away, will nearly always return in a few minutes.

"Taken at Lindula, and common at Kandy and Ratnapura" (F. M. Mackwood).

213. *UDASPES FOLUS*.—Found in India, Burma, Dutch Indies, &c.

A rarity in Ceylon, though Bainbrigge-Fletcher says it is "occasionally a serious pest of ginger and turmeric" in India ("Some South Indian Insects").

I have seen it three times in my garden, and believe it had bred on *Kæmpferia rotunda*, as I caught a freshly hatched one close to the plant, and found a fresh empty pupa case on a leaf. I have also taken it at Kirinde, in the Hambantota District, and have seen specimens from Badulla, Madulsima, and Wellawaya.

"Caught at Batticaloa" (F. M. Mackwood).

214. *TELICOTA BAMBUSÆ*.—Found also in India, Malaya, Australia, China, &c.

It is very common at Haldummulla, and I have taken it in every month, but January. It is not rare at Haputale (5,000 feet), and I have specimens from Colombo, Kandy, Galle, &c.

Usually seen settled on grass by the roadside, but it visits flowers, especially *Duranta*, and is very easy to catch.

"Common at Colombo" (F. M. Mackwood).

215. TELICOTA AUGIAS.—Also found in India, Burma, Malaya, Hong Kong, &c.

This has not been previously recorded from Ceylon, having been mistaken for *T. bambusæ*.

Elwes and Edwards say that it differs from *bambusæ* in having the "lower outer angle of the yellow spots in cells 2 to 4 narrowly produced along the contiguous vein nearly or quite to the termen; terminal dark band brown." Whereas in *bambusæ* the "lower angle of the yellow spots in cells 2 to 4 is not, or but little, produced; terminal margin black-brown."

The male can also be at once distinguished from male *bambusæ* by having narrow yellow streaks along all the veins at the apex of the fore wing. As pointed out by Elwes and Edwards, there is a marked difference in their clasps. See Pl. 5, figs. 1 and 2.

The female is a much duller insect than female *bambusæ*, the ground colour being dark brown, not black-brown, and the orange markings being narrower. The spots in interspaces 1 to 3 have their lower edges produced along the contiguous veins, but to a much less extent than in the males. The veins at the apex of the fore wing are not edged with yellow. The under side of the hind wing has a marked greenish tinge.

There seems to be a tendency to grade.

It is very common at times at Haldummulla. The larva is said to feed on sugar cane, which is extensively cultivated in native gardens here. I have specimens from Wellawaya and Galle.

216. PADRAONA GOLA, E.; *Padraona goloides*, M.—Found also in India, Malaya, China, Dutch Indies, &c.

Moore says *goloides* is "nearest allied to *P. gola*. Differs from it on both sides in the narrower discal band of the fore wing, the band being also disconnected from the costal spots. The band of the hind wing is also narrower." My series show considerable variation in the width of the band in both sexes, and it is connected to the pre-apical spots in a few of my

males. The prehensores are similar to those of *P. gola*, as figured by Elwes and Edwards.

It is almost always found settled on grass by the roadsides, or at flowers, and is especially attracted by *Duranta*. If disturbed, it darts off very rapidly, but usually settles again near, and is easy to catch. It is very common at Haldummulla all the year round, except in August and September. I have also taken it at Haputale, Galle, Kandy, and Vavuniya.

"A common insect up to 5,000 feet" (F. M. Mackwood).

217. *PADRAONA PSEUDOMÆSA*, M.; *Padraona mæsioides*, E.

218. *PADRAONA MÆSIOIDES*, M.; *Padraona tropica satra*, E.

218a. *PADRAONA DARA* ?

Elwes and Edwards group these as one species, *Telicota dara*. In my preliminary remarks on the *Hesperiidæ* I have already given my reasons for disagreeing with their opinion. I am convinced that there are two very distinct forms in Ceylon, and suspect that there is a third. I do not care to express an opinion as to which of the local forms, here or in India, are entitled to specific rank, and which are merely races, or even varieties. A great deal of investigation is still required before this can be settled. In the meantime I use Moore's names for the two common Ceylon forms.

1st, Pseudomæsa.—This is a large form. The yellow band on the fore wing is broken, the spots in 4 and 5 being never joined to the apical group, but usually to the discal in the male. On the lower wing the band is divided along the veins by brown lines. There is, as a rule, a small well-defined spot in 6, and sometimes a larger faint and diffuse one in 7. It varies much in size. In the female the yellow markings are much reduced, and the band on the fore wing is more broken, the spots in 4 and 5 being almost invariably well separated from both the apical and discal series. On the lower wing there is usually a very minute spot in 6. For prehensores see Pl. 5, figs. 3 and 4. The clasp is very like Elwes and Edwards' figure of that of *dara*, but the tegumen is quite distinct.

This is extremely plentiful at Haldummulla, but I have no specimens from any other locality. My notes give many

localities for *dara*, but I cannot say for certain to which one of the group they refer. It usually settles on grass by the roadsides, but visits flowers in bright sunshine.

2nd, Mæsioides.—This is a small form. I think it is either the one described by Evans as *Tropica satra*, or a closely allied race. He describes the clasp as ending in a bluntly triangular point, but all I have examined show a distinct spine at the apex of the triangle. See Pl. 5, figs. 5 and 6.

The yellow band is almost always continuous, the spots in 4 and 5 being joined to both the discal and apical series; it, however, varies greatly in width. The band on the hind wing is not divided by brown lines along the veins. There is almost invariably a large spot in 7, but very rarely one in 6. In the female the yellow markings are much reduced, and the spots in 4 and 5 are not always joined to the apical series. I have one aberration of the female, in which the spots in 4 and 5 are quite obsolete, and the discal band almost so. I took it at Anuradhapura in company with normal specimens.

It is not so plentiful as *pseudomæsa* at Haldummulla, but is very abundant in the Galle District. I have also taken it at Vavuniya and Mannar.

3rd, Dara?—This is intermediate in size between the two last. The male closely resembles *pseudomæsa* female; in fact, I had placed it as such in my collection till I noticed the sex mark. This, in all Ceylon forms, is a deep black streak of specialized scales above the middle of vein 1 of the fore wing. Elwes and Edwards have overlooked this. The yellow band is very narrow, and the spots in 4 and 5 are well separated from both the discal and apical series. There is a spot in 7, but none in 6. The band on the hind wing is not divided by brown lines. The female has the yellow markings greatly reduced, and the band on the hind wing is broken up by brown lines along the veins. The under side of the hind wing in both sexes has a very distinctive greenish tinge, which is, I believe, typical of *dara*. The prehensores differ slightly from those of *pseudomæsa*, but the differences appear to be constant; however, I have so far only been able to dissect four males. See Pl. 5, figs. 7 and 8. It may prove to be only a seasonal form of *pseudomæsa*.

The only place I have seen it is on the cart road near Haldummulla in March and May.

In working out this group, I am greatly indebted to some notes on Indian Butterflies published by Colonel Evans in the Journal of the Bombay Natural History Society (Vol. XXIII., p. 307). I am also indebted to Mr. F. Hannington, I.C.S., for some specimens of two forms from Coorg. One of these is very like *pseudomæssa* externally, but the prehensores are quite distinct; the other is very unlike any Ceylon form both externally and internally.

{ 219. HALPE CEYLONICA.

{ 220. HALPE EGENA, E. ; *Halpe brunnea*, M.

Halpe egena is restricted to Ceylon. *H. ceylonica* is also found in Southern India.

According to Moore, who described *brunnea* (= *egena*) from a single female specimen, the chief distinction between it and *ceylonica* lies in the ground colour, which is "dark vinous brown" in *brunnea*, and "dark brown, base of wings and body olive-brown," in *ceylonica*.

Elwes and Edwards distinguish them by the discal band on the under side of the hind wing, which is brownish-yellow, and very indistinct, in *egena*, and yellowish-white, and clearly defined, in *ceylonica*. The colour of the discal band is usually as they state, but it varies greatly in definition, and I have specimens of *ceylonica* in which it is so diffuse as to be almost indistinguishable. My experience is that the ground colour is the only reliable test. In the specimen of *egena* described by Moore the discal band was evidently exceptionally indistinct. As a rule, the spots on the fore wing are larger in *ceylonica*, but they vary much in size in both. In *ceylonica* ♂ the pre-apical spots vary from 1 to 3 in number, but the discal spots vary only in size. I have a specimen of *egena* ♂ with the wing entirely unspotted. The spot in the cell is rarely present in *egena* ♂, and rarely absent in *ceylonica* ♂. I can perceive no difference whatever in the prehensores. See Pl. 5, figs. 9 and 10. The females are much rarer than the males, and the material at my disposal is rather limited. Apart from the ground colour, the chief difference between them seems to be the spots in interspace 1 of the fore wing. I have

so far examined 15 *ceylonica* ♀ and 6 *egena* ♀. The usual marking in *ceylonica* is apparently one spot visible above and 2 below, but one or more of these are sometimes absent, and I have two specimens in which this interspace is quite unspotted. In 5 *egena* ♀♀ the interspace is unmarked, but in one specimen there is a white spot visible above and below. Personally I can find no reliable tests for separating the two forms, except by the ground colour when freshly caught, and I strongly suspect them to be only seasonal varieties of the same insect.

H. ceylonica.—I have never taken this myself, but the native collectors seem to be able to get the males in any quantity at Kandy; females are apparently scarce. It is also common at Ratnapura, and Mr. Hannington has sent me a specimen from Coorg, which seems to be identical. It is very distinct, both externally and internally, from *H. moorei*.

“Numerous at Kandy in the latter part of the year, and found at Pundaluoya” (F. M. Mackwood).

H. egena.—This was originally described by Felder from “Kalupahana, Ceylon,” and I think there can be little doubt that this estate was meant. The gentleman who was Superintendent then (Mr. R. E. Pineo) told me that naturalists used frequently to stop with him on their way to collect in the Bintenna country. I have taken it on the estate.

It is a very local fly, and was formerly always plentiful on a *Duranta* hedge at the bungalow on Blackwood estate, 2 miles from here. This hedge has now been cut out, but a few specimens may still be taken in the garden there, in July–August and November–December. I have also taken it on the Haldummulla–Horton Plains bridle road, and received specimens from Ratnapura.

221. *HALPE DECORATA*.—Peculiar to Ceylon, and confined to the wettest zone.

I have never caught this myself, but have received a lot of males from Ratnapura. The female was discovered by the

late Mr. C. C. Gilbert. It is extremely rare. Messrs. F. M. Mackwood and T. G. Elliott have given me specimens, and my collector caught one at Deniyaya. On the upper side the fore wing differs from that of the male in having an orange spot above vein 1, and the orange patch in the cell is much reduced in size. On the lower wing the large median yellow patch is much reduced, or even sometimes entirely obsolete. All markings are much darker in colour. The ground colour of the under side is entirely different, being brownish-red instead of gamboge yellow; the spots on the fore wing agree with those on the upper side, except that that on vein 1 is more diffuse. On the lower wing the small black spots are usually very indistinct or absent, but when present they correspond in position with those of the male. I figure the prehensores on Pl. 5, figs. 11 and 12.

"Very abundant in Ratnapura, and parts of Ambegamuwa. Caught also at Labugama and Kottawa. Females very scarce" (F. M. Mackwood).

222. *BAORIS PENCILLATA*, M.; *Baoris oceia*, E.—Evans says (Bombay Natural History Society Journal, Vol. XXIII., p. 309): "Dr. Chapman has dissected fourteen specimens, and finds that there are four species under the name *oceia*, viz., *oceia*, confined to the Philippines; *leechii*, El., confined to China; *farri*, M., the common Indian species; *unicolor*, M., from Sikkim and Assam, a species with no markings on the fore wing."

Elwes and Edwards figure the prehensores of *oceia*, *leechii*, and *simillima*, but none of them resemble those of our Ceylon race. See Pl. 6, figs. 1 to 4. Till the question is settled as to whether this is *pencillata* or *farri*, I think Moore's name may stand.

The few males in my collection vary in the number of spots on the fore wing; in one there are spots in 2, 3, 4, 6, 7, and 8, the latter being very minute; in another there are spots in 2 and 3 only. The cell of the fore wing and the whole hind wing are unspotted in all.

I do not know the female, though possibly I have a specimen, and have described it further on as an unknown form of *Paranara* (see No. 225c later). Mr. Mackwood has given me one

from the Andamans ; it differs from all large Ceylon *Parnaras* (except *conjuncta*), in having two large spots in the cell. I have seen nothing like it in Ceylon.

I consider *pencillata* a great rarity. Till last year my only specimen was one given to me by the late Mr. Butt, of Avissawella, in 1889. I have now received one each from Galle and Deniyaya, and Mr. Mackwood has given me two from Ratnapura.

It is apparently confined to the wettest zone.

" Found at Avissawella, Pundaluoya, and Lindula " (F. M. Mackwood).

223. CHAPRA MATHIAS ; *Chapra agna*, M.

223a. CHAPRA SUBOCHRACEA ; *Chapra mathias*, M.

C. mathias, or races thereof, is found from Turkey to Japan, and in Australia.

Moore gives *mathias* and *agna* from Ceylon, and says *agna* is larger than *mathias*, and has smaller spots. Personally I find that the form with the small spots is usually the smaller insect. Elwes and Edwards agree with Moore in dividing it into two species, naming the one with the small spots *mathias*, and the one with the large *subochracea*. There are certainly two distinct forms in Ceylon which are extremely common ; they fly together, and the males, at any rate, do not seem to grade.

The male of the large form, with large spots, is much lighter in colour both above and below ; the fore wings are broader in proportion to their length, and the hind wings more rounded. The females show this difference in the shape of the wings to a greater degree than the males. There is little variation in either form in the number of spots on the fore wing ; the males of *subochracea* usually have a spot in interspace 8, which is seldom present in *mathias* ; all the females of both forms in my collection show this spot. A spot in 5 is present, more often than not, in both females, but it is only traceable in two of my specimens of male *subochracea*.

The differences in the prehensores are exceedingly minute and hard to see, though they are apparently constant ; the chief one lies, as pointed out by Elwes and Edwards, in the apex of the tegumen. Personally I attach much more

importance to external differences, and the fact that I have seen no signs of grading in the males. They may be only seasonal varieties, as the dry and wet season forms of most species fly together in Ceylon. Both fly all the year round at Haldummulla. A small form of *subochracea* is found in the Northern Province (and very rarely, during the drought, at Haldummulla). In this the under side of the hind wing is suffused with pale gray.

Both are potential pests of paddy.

PARNARA.—The true *Parnaras*, or those without a sex mark, are only represented by a few species in Ceylon, but they seem to have been little studied, and I find some difficulty in naming them. Moore gives five species: *kumara*, *seriata*, *narooa*, *cingala*, and *bada*. Evans gives *phillippina*, *kumara*, *austeni*, *conjuncta*, *colaca*, and *bada*. These separate easily into two groups, the large and the small, the latter consisting of *cingala* and *bada*. The large can be again subdivided by the colour of the under side of the hind wing, viz., reddish-brown or greenish-brown.

There is no Indian collection in the Colombo Museum, and little literature on the subject, so the most I can do is to roughly describe our forms, leaving it to Indian collectors to compare the descriptions and figures of the prehensores with Indian specimens and settle their true status.

I hope to send slides of the prehensores to the Entomological Section of the Agricultural Research Institute at Pusa for their assistance.

Group A.—Under Side of Hind Wing Reddish-Brown.

224. **PARNARA KUMARA** ♂, M.—Expanse 40–45 mm. No spot in cell of fore wing; hind wing unmarked. Spots on the fore wing in 2, 3, 4, 6, and 7, some or all of the three latter being sometimes obsolete. Under side: Costa and apex of fore wing and the whole hind wing dark orange-brown, deepening in worn specimens into vinous brown. As a rule,

there are no spots in interspace 1 of the fore wing below, but very rarely a small very diffuse one is present. I have three specimens in which there is a minute spot showing above on vein 1, but in colour, shape of the wings, and prehensores they are identical with this species.

I have dissected many specimens with both bright and dull coloured under sides and find the prehensores to be identical. See Pl. 6, figs. 5 to 8. The clasp answers exactly to Elwes and Edwards' illustration of that of *austeni*, the tegumen, however, is quite distinct from that of either *austeni* or *kumara*, though nearer to that of the former.

It occasionally appears in great numbers on the Haldum-mulla-Horton Plains bridle road, and a few can be taken as low as 3,000 feet here. It is abundant on the hills above Ratnapura. It usually settles low along the roadsides, and does not fly far if disturbed.

224a. *PARNARA KUMARA* ♀, M.; *Parnara phillippina*.—Differs from No. 224 as follows:—Expanse 42–48 mm. Spots on fore wing in 1, 2, 3, 4, 6, 7, and 8. The spot in 8 is sometimes missing, and there is occasionally a second minute spot in 1 just below vein 2. The wings are broader in proportion to their length, the termen and dorsum of the fore wing being almost equal. The colour of the under side and cilia are identical with No. 224. There is always a diffuse spot in interspace 1 below, and often a second very minute one touching vein 2.

Elwes and Edwards' table of the species of *Parnara* gives the presence of a spot in 1 as the difference between *phillippina* and *kumara*. This form differs from the preceding mainly in that respect, and therefore it is usually labelled *phillippina* in Ceylon collections.

Moore believed it to be the female of No. 224, and I am very strongly of opinion that he was right. Both forms are very plentiful at times, and invariably appear together. I have never seen any specimens of No. 224 which were not males, nor of No. 224a which were not females. The sole objection, I understand, to Moore's opinion is that the female of *kumara* has no spot in interspace 1. I do not, however, believe that No. 224 is rightly named *kumara*.

224*b*. *PARNARA AUSTENI*.—This is given by Elwes and Edwards from Ceylon on the authority of Mr. E. E. Green. I have never seen a specimen.

As far as I can follow Elwes and Edwards' work, the description is as follows.—Expanse 37–41 mm. *One or two* spots in the cell of the fore wing in the male, none in that of the female. Hind wing unmarked. No white spot in interspace 1 of the fore wing of the male; a white point near vein 2 of the female. Under side: apex of fore wing and whole of hind wing reddish-yellow-brown.

224*c*. *PARNARA KUMARA* ♀.—A single battered female specimen. Very similar to No. 224, but the spots in 2 and 3 are larger, and there is a spot in 8. On the under side of the fore wing there is a small spot on vein 1 so diffuse as to be almost obsolete. Under side dark vinous brown.

To sum up Group A. I believe Nos. 224, 224*a*, and 224*b* only represent one species, and that that will prove to be a local race of *austeni*. The males differ from that species in being larger, and in having no spots in the cell of the fore wing. The females apparently differ only in size. No. 224*c* may be a variety of No. 224*a*. I have only seen the one poor specimen. The markings of the fore wing answers to the description of *kumara* ♀, in having no spot below vein 2 above; true *kumara* may, therefore, exist in Ceylon, though I have not yet identified the male.

Mr. Hannyngton has sent me two pairs of a very closely allied race from Coorg. They differ from Nos. 224 and 224*a* in being smaller, and the female has a white spot in interspace 2 of the hind wing only visible on the under side. The clasp is identical with that of our Ceylon race, but the tegumen differs slightly.

Group B.—Under Side of Hind Wing Greenish-Brown.

225. *PARNARA SERIATA*, M.; *Parnara phillippina*.—Moore describes it well, as “smaller than *kumara*, the spots smaller and less angular. Under side greenish-brown, not deep ochreous brown.”

Expanse 36-42 mm. Spots on fore wing above in 1, 2, 3, 4, 6, and 7. In two of my specimens there is also a minute dot in 1, just below vein 2. In a few others the spot on vein 1 is almost obsolete. No spot in cell. Under side: Spots on fore wing as above, except that there are always *two* diffuse spots in 1. I have seen two specimens which showed a rudimentary spot in the cell which did not show above. Costa, apex of fore wing, and whole of hind wing brown, irrorated with yellow scales, giving a marked greenish tinge. The fore wing is much narrower than that of No. 224.

This is also classed as *phillippina*, though very unlike No. 224a in colour and shape of the wings. Elwes and Edwards say: "We think the identification must remain somewhat uncertain." The clasp bears a resemblance to that of *phillippina*, but the tegumen is very different. See Pl. 6, figs. 9 to 12. In the very large number of specimens that I have examined I have found no variations in these. I have no specimens of *phillippina* with which to compare it, but it does not resemble the figures of that species in Elwes and Edwards' work. It varies little, except in the size of the spots.

It is found from sea level to 3,000 feet elevation. I have taken it at Haldummulla and Galle, and received specimens from Kottawa and Ratnapura. The native collectors can get abundance of males in the Kandy District, but seem quite unable to catch the females there.

225a. *PARNARA SERIATA* ♀, M.—Expanse 42-45 mm. Spots on fore wing in 1, 2, 3, 4, 6, 7, and 8. There is also a second very small spot in 1, just below vein 2. The spot in 8 is sometimes missing. No spots in cell visible above. Under side: Two large diffuse spots in 1. Many specimens also show rudimentary spots in the cell, of which the lower is the larger. In ground colour and shape and colour of the spots it is identical with No. 225. and I am quite confident that it is the female *seriata*.

I have taken it at Galle in the same localities and at the same seasons as *seriata* ♂, and I have specimens from Ratnapura and Balangoda. It is far rarer than the male, and I have only a poor series.

225*b*. *PARNARA SERIATA* ♀ var. ?—This differs from all others in Ceylon, in having a single white spot on the under side of the hind wing, in the basal half of interspace 2, clearly defined below, and sometimes visible above. The only *Parnara* mentioned by Elwes and Edwards with this spot is *P. bromus*, of which they say: "I have great doubt as to whether *P. bromus* can be separated from *P. phillippina* The fact remains that in *phillippina* the cell spots of the fore wing are wanting, or at most feebly developed, and the hind wing below is unspotted, and in *bromus* there are two well-developed cell spots visible on the upper side of the fore wing, and the hind wing below bears a small pale spot near the middle of cell 2. We have not seen any intermediate specimens."

This also differs from No. 225*a*, in having the spot below vein 2 on the fore wing sometimes enlarged into a streak, almost joining the spots in 1 and 2. All my specimens show two rudimentary spots in the cell below, and in most cases the upper one is visible above as a minute white dot.

All the specimens I have seen were females. I have five from Galle and one from below Haldummulla. Mr. T. G. Elliott has shown me three from Ratnapura. In April, 1918, I took one specimen at Galle intermediate between Nos. 225*a* and 225*b*. It has a white spot in interspace 2 of the hind wing on one wing only.

225*c*. *BAORIS PENCILLATA* ♀ ?—Expanse 43 mm. Spots on fore wing in 1, 2, 3, 4, 6, 7, and 8. No spot in cell. Hind wing unmarked. It differs from Nos. 225*a* and 225*b* as follows:—The yellow hairs above and scales below are darker. The fore wing is broader in proportion to its length, and is more evenly convex on the termen. The spot on vein 1 is much smaller, and those in 2 and 3 are distinctly excavated on the outer margin, which I have never seen in any specimen of *seriata*. On the under side of the fore wing there is only one small diffuse spot in interspace 1. It is almost identical with No. 224*a* in markings and shape of the wings, but differs in the ground colour, especially of the under side of the hind wing.

I have only a single specimen, and Mr. Elliott has shown me another, both females from Ratnapura.

To sum up Group B. I believe Nos. 225, 225a, and 225b represent one species, viz., Moore's *P. seriata*. As to whether this is a good sub-species, a local race, or merely a variety of *phillippina*, I can express no opinion, as I have no specimens of typical *phillippina* with which to compare it. I rather expect further investigation will prove it to be a local race of that species. Till this is settled I think Moore's name may stand.

No. 225c is, I think, quite distinct. The material available at present is too limited to decide anything, but I expect it will prove to be the unknown female of *B. pencillata*.

226. PARNARA NAROOA, M.; *Parnara conjuncta*, E.—*P. conjuncta* is also found in India, Burma, Malaya, Hong Kong, &c.

Elwes and Edwards say: "Though we have no specimens from India or Ceylon, yet we think the plate in 'Lep. Ceylon' sufficiently identifies the species, which has been hitherto known as *narooa*, Moore." Personally I regard such an identification as eminently unsatisfactory, as the plate is a very poor representation of the insect.

It is by far the largest of the genus in Ceylon, the females attaining up to 55 mm. in expanse, and it can be at once distinguished from all our other large *Parnaras* by the two large spots in the cell and the row of spots on the under side of the hind wing. From *subochracea* ♀ it can only be distinguished by its greater size and darker ground colour. The tegumen seems to be very near that of *conjuncta*, but the clasp differs. It may possibly prove to be a local race of *conjuncta*.

The spots vary much in size. In some specimens there is a minute spot below vein 2 and another in interspace 5; in one of my specimens this latter spot is crescent-shaped. Either two or three spots are visible on the hind wing above; below there are usually four discal and one in the cell. In fresh specimens the spots on the fore wing have a pronounced yellow tinge, but this soon fades.

It is not rare at Haldummulla, but is difficult to catch in first class condition. I have also taken it at Haputale, Madampe, and Galle, and have specimens from Ratnapura.

“Taken at Kandy and Ratnapura in July” (F. M. Mackwood).

227. *PARNARA BADA*.—Found also in India, Malaya, Burma, China, and Japan. Evans gives *guttatus* as a distinct species from Chitral and Assam.

This is the smallest *Parnara* in Ceylon. It can be distinguished from *cingala*, which is only slightly larger, by the absence of the spot in interspace 1. The spots vary greatly in size, shape, and number. On the fore wing there are normally spots in 2, 3, 4, 6, 7, and 8, but those in 4 and 8 are often absent. I have one specimen with a spot in 5, and two with a linear spot on the lower edge of the cell, near the base of vein 3. On the hind wing there is normally a row of four spots in interspaces 2 to 5, visible both above and below. I have two specimens in which the hind wing is quite unspotted above or below, and several with only one to three spots below. I have also two or three with five discal spots in interspaces 2 to 6, and one in the cell. The spot in 6 is never in line with the others.

For comparison with Indian specimens, I give a figure of the prehensores. Pl. 7, figs. 5 to 7.

It is not very common at Haldummulla, but becomes much more abundant at lower elevations, being widely distributed through the low-country. I have taken it at Wellawaya, Hambantota, Galle, Vavuniya, Jaffna, Mannar, &c., and have specimens from Kandy.

228. *PARNARA CINGALA*, M. : *Parnara colaca*, E.—*P. colaca* is also found in India.

Moore thought it distinct from *colaca*, but did not state in the “Lepidoptera of Ceylon” how it differed. I give a sketch of the prehensores for comparison with Indian specimens. Pl. 7, figs. 8 to 10.

It varies much less than the last species (*bada*), the main variation being in the number of spots in the cell; these may be two, one, or none; all varieties seem to be equally common in both sexes. The number of the spots on the fore wing outside the cell never seems to vary, being always one each in 1, 2, 3, 4, 6, 7, and 8. On the hind wing below there are always three large spots in 2, 3, and 5, and usually a smaller

one in 4 ; of these, one or two are, as a rule, visible above. Some varieties are very like *mathias* ♀, but can be distinguished by the absence of the small spots just below vein 2 and in 5 of the fore wing above, and of that in the cell of the hind wing below.

It is the commonest skipper at Haldummulla, and flies all the year round. I have also taken it at Ohiya (6,000 feet), Jaffna, Mannar, Galle, &c. It is chiefly found in the grass by the roadsides, and visits flowers when the sun is shining.

229. ISMENE ATAPHUS, E. ; *Ismene cædipodea*, M.—Also found in India and Burma.

I. cædipodea differs in having the “costa of the hind wing folded over on to the upper surface of the apex” (Elwes and Edwards). It is found in Java and Sumatra.

Very rare in Uva, but well distributed. I have taken it at Ohiya (6,000 feet), Haldummulla (3,500 feet), and Hambegama tank (400 feet). It is fond of settling in the beds of streams, on wet rocks, or sand.

For prehensores see Pl. 7, figs. 11 and 12.

“Not uncommon round Kandy. Taken at Trincomalee” (F. M. Mackwood.)

230. HASORA BADRA. — Found also in India, Burma, Malaya, Dutch Indies, China, &c.

I have taken a pair in my garden, but have seen no others in the Province of Uva. I have specimens from Ratnapura, Kottawa, Deniyaya, and Kandy. I understand it is not rare at Balangoda, and has been taken in Nuwara Eliya.

The prehensores are figured on Pl. 8, figs. 5 and 6.

“Not uncommon around Kandy. Caught at Kottawa” (F. M. Mackwood).

231. HASORA ALEXIS ; *Hasora chromus*, E. ; *Parata chromus*, M.

232. HASORA BUTLERI, E. ; *Parata alexis*, M.

P. butleri is found also in Southern India. Races of *chromus* are found in India, Burma, Dutch Indies, &c.

Elwes and Edwards treat these as varieties of *H. chromus*. The external differences are very marked, they fly together and do not grade, and their prehensores are widely different. To judge from the latter, *H. chromus* is not found in Ceylon.

The clasp of *alexis* agrees with that of *inermis*, to which it is apparently closely allied, but the tegumen is entirely distinct. The clasp of *butleri* is the same as that of *chromus*, but, again, the tegumen is very different. See Pl. 8, figs. 1 to 4.

The upper sides of the males are similar, but the under sides are very distinct, the most prominent difference being that *butleri* has a broad, sharply defined, white band on the lower wing, and *alexis* has a narrow diffuse one. The female of *butleri* has, as a rule, two small white spots on the upper side of the fore wing in 2 and 3, of which the lower is much the smaller, but both these spots are often absent. In this case the ♀ can only be distinguished from the ♂ by the absence of the sex mark. The female of *alexis* has two spots in all my specimens, of which the lower is the larger. It has also occasionally a minute dot in 6.

Mr. Hannington sent me a *chromus* ♀ from Cooorg. It is larger than our Ceylon forms, the spots in 2 and 3 are much larger, and there is a spot in 6 and a small dot in 7. The band on the hind wing is broader than that of *alexis*, but is not sharply defined like that of *butleri*.

They suddenly appear in great numbers, generally during the north-east monsoon, and I am of opinion that they "flight." In October, 1916, I noticed great flights of large Hesperiidæ on several evenings just before dark, all going south. I put on two native collectors and tried myself to catch specimens, but owing to the bad light and the speed of the flight I secured none. They can be walked up in the daytime in the tea or jungle, but then only fly a short distance, and settle on the under side of a leaf with their wings closed over their backs. They visit flowers in the early morning or evening or on a dull day, and I have known them come to my moth lamp at night.

Both are extremely plentiful all over Uva up to the highest elevations, and I have specimens of *butleri* from Kandy and Deniyaya, and of *alexis* from Kandy, Jaffna, and Mannar.

Alexis: "Numerous in low jungles of North Matale."

Butleri: "Colombo, East Matale" (F. M. Mackwood).

233. *BIBASIS SENA*.—Also found in India and Siam.

The colour of the cilia on the hind wing and the patch of long hairs on the dorsum, above the tornus, varies from rather pale orange to orange-vermilion in freshly caught specimens. The fore wing of the female is broader than that of the male, and the hind wing is more rounded.

I consider it a rarity. I have taken one or two specimens on this estate, and in December, 1904, I found several inside Wellawaya resthouse settled on the walls. They were very wary and difficult to catch, so I only got three or four; the others did not return to the resthouse that day. With these exceptions, I have never come across it.

The prehensores are figured on Pl. 8, figs. 9 and 10.

“Found at Kandy and Pundaluoya” (F. M. Mackwood).

234. *BADAMIA EXCLAMATIONIS*.—Also found in India, Burma, Malaya, China, and Australia.

It appears in great numbers at times, usually in company with *H. alexis* and *bulleri*. It has the same habits as these, but seems to be less afraid of the sun, and to visit flowers more on a bright day.

I have notes of its occurrence at Haldummulla, Haputale, Kandy, Galle, Vavuniya, and Mannar, and believe it to be common everywhere at times.

The prehensores are figured on Pl. 8, figs. 11 and 12. That of the clasp is poor, as it does not show the formidable armament of spines on the inner face.

“All over the low-country, and up to 5,000 feet or over” (F. M. Mackwood).

235. *RHOPOLACAMPTA BENJAMINII*, F.; *Choaspes benjaminii*, M.—Found also in India, Burma, China, Japan, Borneo, &c.

There seems to be a doubt as to whether two species are not included under this name, I therefore figure the prehensores of our Ceylon form. Pl. 8, figs. 7 and 8.

It is fairly common in the hills, and was formerly very plentiful on the cart road below the Haputale jungle, but since the Forest Department has cleaned out the original vegetation and planted *Eucalyptus* in its place, this and other hill insects have, of course, disappeared. It is still common between

Haputale and Ohiya, and I have specimens from Maskeliya, the hills above Ratnapura, and Kandy. I have taken it as low as 3,500 feet at Haldummulla.

When walking in the jungle near the Mocha Patanas, Maskeliya, with the late Mr. John Pole, he pointed out the larvæ to me feeding on a shrub, called by the Sinhalese there *hik*. I have been unable to identify this. The name *hik* is usually given to *Odina wodier*, a low-country tree.

The males are nearly always found settled on wet roads or in the beds of streams. They are strongly attracted by birds' droppings. The females are difficult to procure.

"Found at Kandy, Ramboda, Dolosbage, and Dikoya"
(F. M. Mackwood).

ADDENDA.

27a. *ELYMNIA MERULA*.—Colonel Swinhoe gives this as a new species from Ceylon (Ann. Mag. Nat. Hist., No. 93., September, 1915, Vol. XVI., page 171). His description is: "♂ upper side deep black, as dark as *E. hecate*, Butler, from North Borneo; fore wing with the costa spotted with blue, three blue streaks near the apex, and three sub-marginal blue spots in interspaces 2, 3, and 4; hind wing with a slight shade of fulvous on the outer margin; outer margins of both wings as in *hecate*. Under side dark chestnut-brown, densely striated with pale blue, fore wing with white costal points, which become thickly clustered together at the apex; hind wing with a small bluish-white spot below the middle of the costa.

"Expanse of wing. 2 8/10 inches.

"Habitat: Kandy, Ceylon.

"Except for the white spot on the hind wings beneath, it much resembles *hecate*."

I know nothing of the history of this insect. It is difficult to imagine a new species of a large butterfly being discovered at Kandy, which is the headquarters of the native collectors, and the best worked district in Ceylon. From the description it seems possible that it may be a melanism of *E. fraterna*. It is

larger than normal in that species, but the description of the under side tallies very closely.

98. *NACADUBA NOBELA*.—Since Part I. was published I have received sixteen ♂♂ of this from Wellawaya, and have now no doubt as to its being quite distinct from *N. ardates*. It seems to vary very little.

In addition to the distinctions previously mentioned, I notice that the cilia at the apex of the fore wing are pure white, and those of the hind wing are lighter than those of *ardates*.

128, 129. *APHNÆUS ICTIS* and *NUBILUS*.—Mr. F. A. Fairlie, who made collecting trips to the Northern Province some years before the railway to the North was built, writes as follows in reference to my remarks in Part I. :—

“Under *A. nubilus* you describe a butterfly I have taken many specimens of at Iranaimadu resthouse, about 50 miles from Jaffna on the North road, which I think has not yet been named. I took it with an equal number of *A. ictis*, race 1, and it is certainly quite distinct.

“At Manipai, Jaffna, I took races 2 and 3 of *A. ictis*, also with race 1, and I consider these also quite distinct from *A. ictis* No. 1, and have always considered them to be *A. nubilus*. This was in July and August, 1890.

“I sent several specimens of them to De Niceville at that time, and he named those without the discal spot *A. nubilus*, race 3 of your notes. Race 2 appears to me to be only a variety, and cannot be separated from race 3, but both distinct from race 1, which I call typical *A. ictis*.

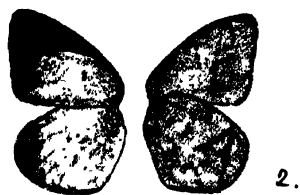
“The blue irridescence on both wings of the male of Nos. 2 and 3 is more violet than in the *Aphnæus* you describe under *A. nubilus*, and spreads over a larger area of the fore wing in my specimens, and the under sides are paler red.”

132. *TAJURIA JEHANA*.—In September, 1918, I took two pairs of this at Pointsettia blossom in my garden (3,000 feet).

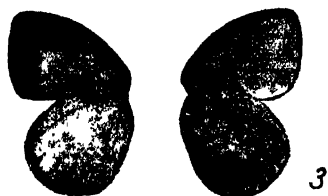
These specimens are larger, much darker in colour, and have far broader wings than those from Jaffna, but agree in markings. They were taken at the end of a severe drought in company with *T. longinus*. They may prove to be a new species.



1.



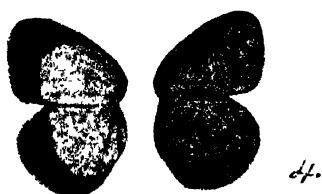
2.



3.



5.



4.



6.



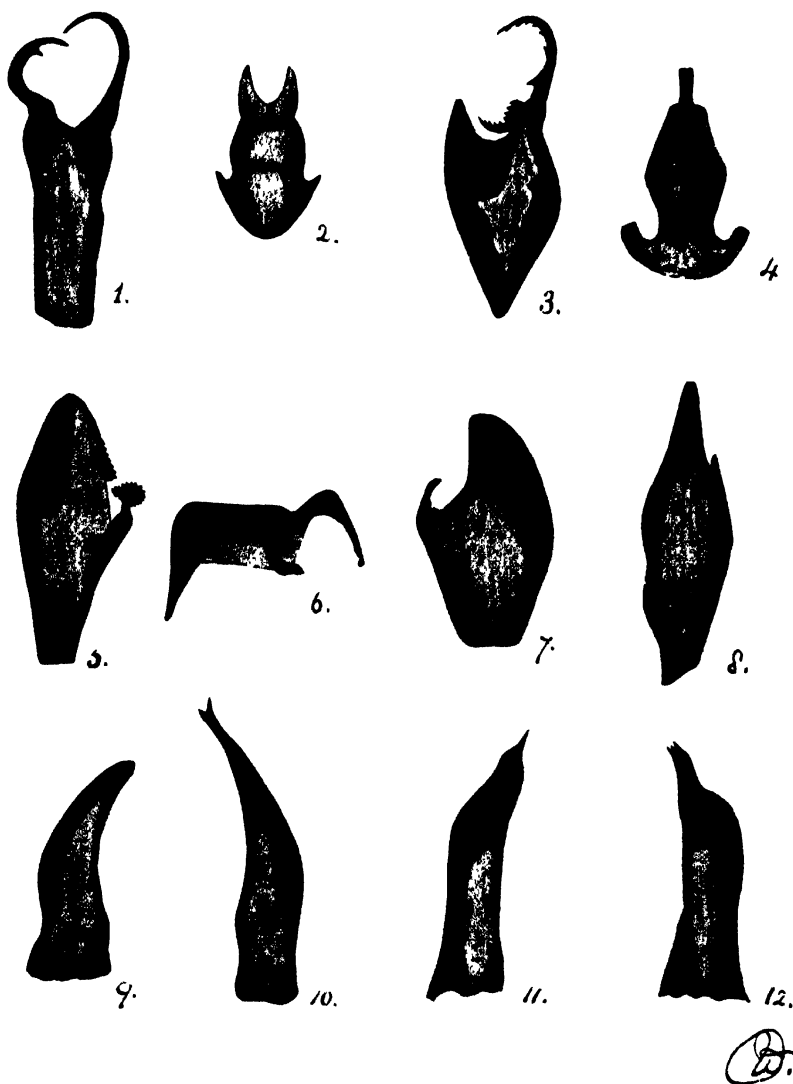
7.



8.

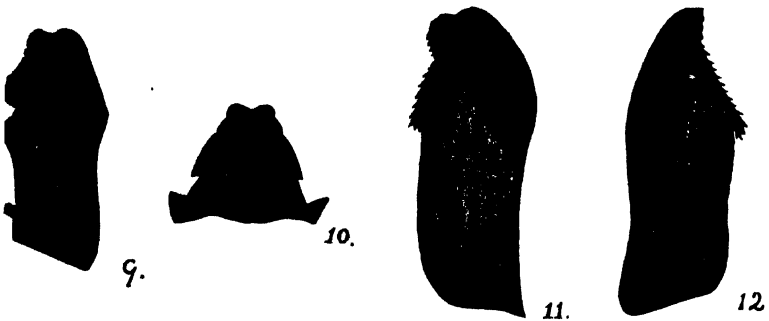
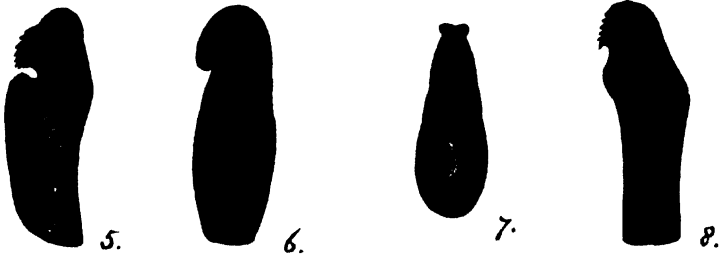
1. *Tettus libythea* normal form
2. Do cold season form
3. *Tettus venata* var. *cingula* ;
4. Do ;

5. *Tettus venata* var. *rama* ;
6. Do ;
7. *Tettus rotundalis* ;
8. Do ;



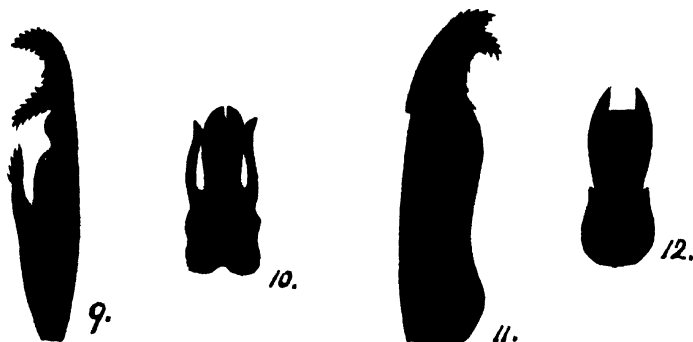
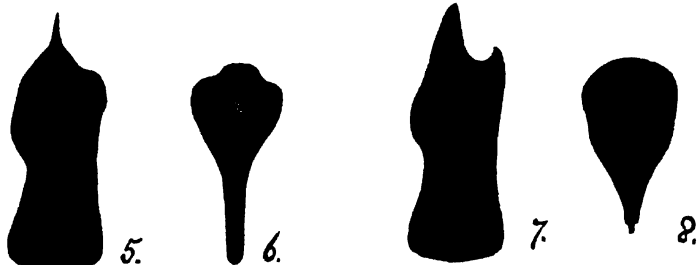
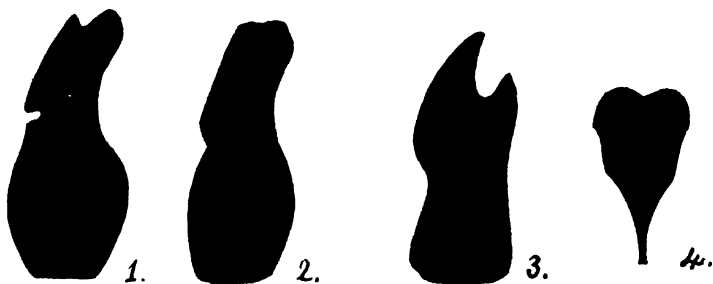
1. *Hantana infernus*: inner face of clasp
2. Do. dorsal aspect of tegumen
3. *Tapena thwaitesi*: inner face of clasp
4. Do. dorsal aspect of tegumen
5. *Coladema tissa*: inner face of clasp
6. Do. dorsal aspect of tegumen

7. *Tagiades distans*: inner face of clasp
8. *Tagiades atticus*: inner face of clasp
- 9 and 10. *Caprona ransonnietii*: inner face of clasp
- 11 and 12. *Caprona siamlica*: inner face of clasp



1. *Sarangesa albiellia* : inner face of clasp
2. Do. dorsal aspect of tegumen
3. *Baracus vittatus* : inner face of clasp
4. Do. dorsal aspect of tegumen
5. *Suastus gremius* : inner face of clasp
6. *Suastus minuta* : inner face of clasp

7. *Suastus minuta* : dorsal aspect of tegumen
8. *Hyarotis adrastus* : inner face of clasp
9. *Matapa aria* : inner face of clasp
10. Do. dorsal aspect of tegumen
11. *Paduka lebadæa* : inner face of clasp
12. *Gangara thyrsis* : inner face of clasp



(2)

1. *Telicota bambusa* : inner face of clasp

2. *Telicota angus* : inner face of clasp

3. *Padraona pseudomesa* : inner face of clasp

4. Do. dorsal aspect of tegmen

5. *Padraona maeioides* : inner face of clasp

6. Do. dorsal aspect of tegmen

7. *Padraona dara* ♀ : inner face of clasp

8. Do. dorsal aspect of tegmen

9. *Halpe cydonia* (or *egena*) : lateral aspect of clasp

10. Do. dorsal aspect of tegmen

11. *Halpe decorata* : inner face of clasp

12. Do. dorsal aspect of tegmen



1.



2.



3.



4.



5.



6.



7.



8.



9.



10.



11.



12.

1. *Baoris pencillata* : inner face of clasp

2. Do lateral aspect of tegumen

3. Do. dorsal aspect of tegumen

4. Do ventral aspect of tegumen

5. *Parnara kumara* ? : inner face of clasp

6. Do. lateral aspect of tegumen

7. *Parnara kumara* ? : dorsal aspect of tegumen

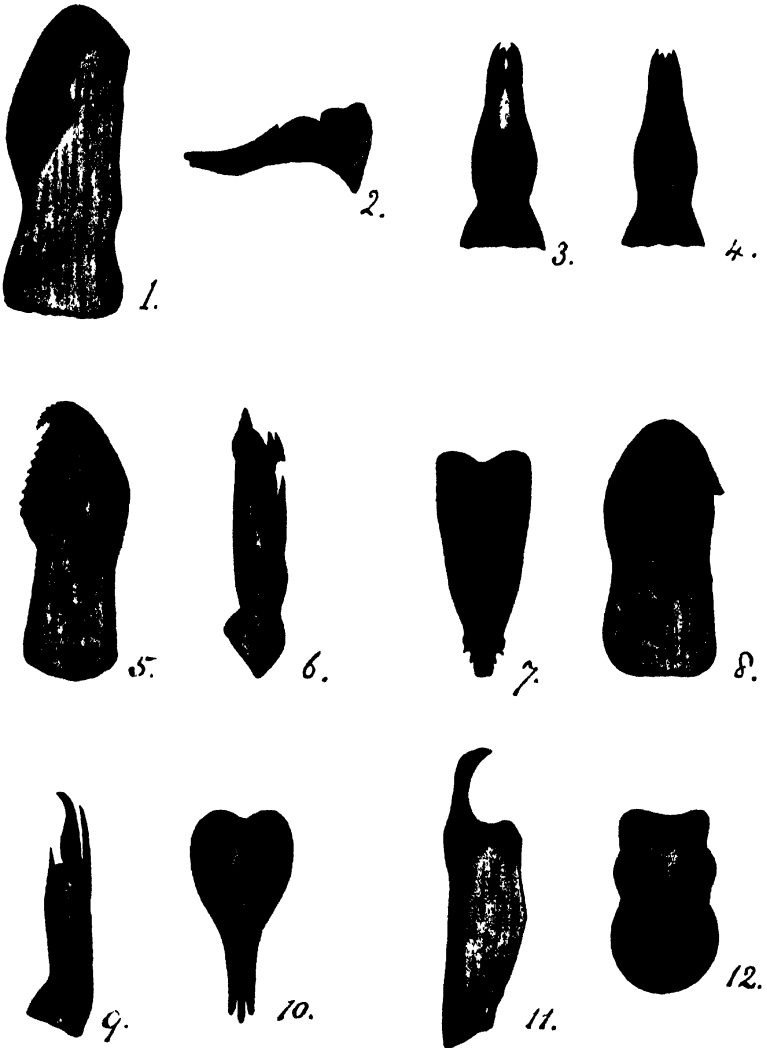
8. Do. ventral aspect of tegumen

9. *Parnara seriata* : inner face of clasp

10. Do. lateral aspect of tegumen

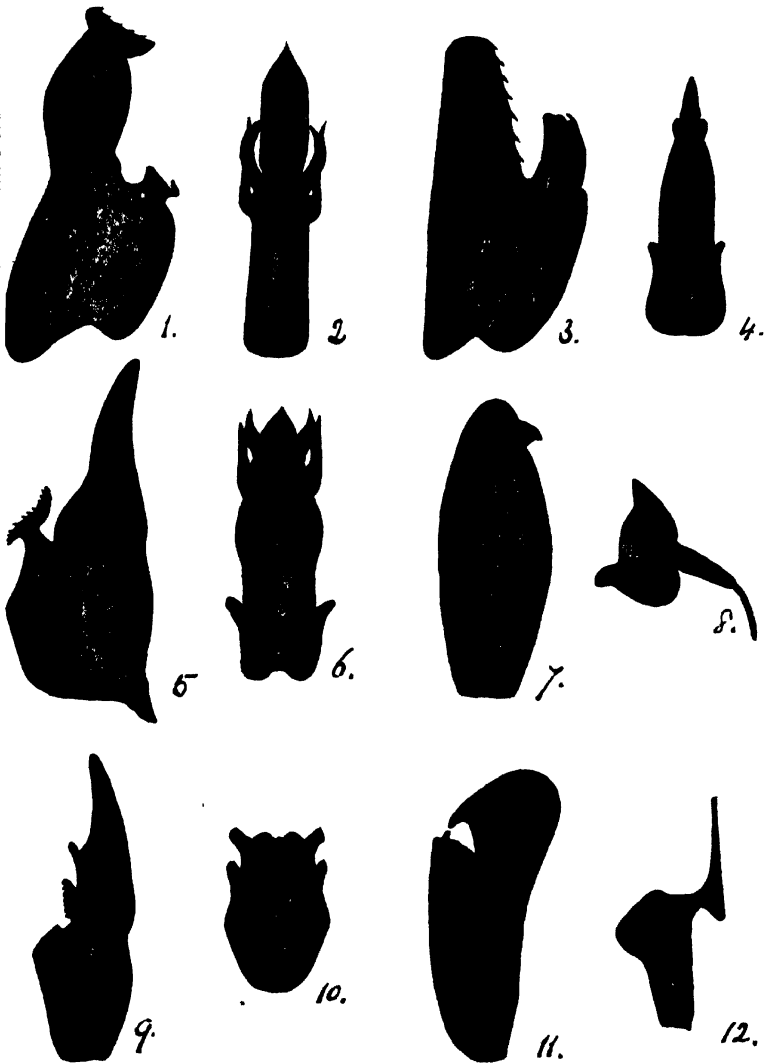
11. Do. dorsal aspect of tegumen

12. Do. ventral aspect of tegumen



1. *Parnara narosa* : inner face of clasp
2. Do. lateral aspect of tegumen
3. Do. dorsal aspect of tegumen
4. Do. ventral aspect of tegumen
5. *Parnara bada* : inner face of clasp
6. Do. lateral aspect of tegumen
7. Do. dorsal aspect of tegumen

8. *Parnara cingala* . inner face of clasp
9. Do. lateral aspect of tegumen
10. Do. dorsal aspect of tegumen
11. *Ismene staphus* : inner face of clasp
12. Do. dorsal aspect of tegumen



1. *Parata butleri*: inner face of clasp
2. Do. dorsal aspect of tegumen
3. *Parata alexis*: inner face of clasp
4. Do. dorsal aspect of tegumen
5. *Hasora badra*: inner face of clasp
6. Do. dorsal aspect of tegumen
7. *Rhoplacampta benjamini*: inner face of clasp

8. *Rhoplacampta benjamini*: lateral aspect of tegumen
9. *Bibasis sena*: inner face of clasp
10. Do. dorsal aspect of tegumen
11. *Badamia exclamatoris*: inner face of clasp
12. Do. lateral aspect of tegumen

NOTES.

Toxorhynchites minimus (Theob.).—References:—Theobald : Jl. Bom. N. H. S., Vol. XVI., p. 237 ; Monog. Culic., Vol. IV., p. 138. Brunetti : Rec. Ind. Mus., Vol. I., p. 324 ; Vol. IV., p. 437.

Since the unique male, which is the type, was captured at Yatiyantota in 1902, no further specimens of this species seem to have been taken, and though it has been moved from the genus *Megarhinus*, in which it was originally placed, to *Toxorhynchites*, the proof of its belonging to the latter genus is wanting in the absence of a female specimen.

It has recently been my lot to obtain two such, and from them it is at once obvious that the species belongs to *Toxorhynchites*.

Before describing the female, I would like to note that Brunetti's remark in his paper "Critical Review of Genera in Culicidæ" (Rec. Ind. Mus., Vol. X., p. 34) that the section *Megarhini* of the sub-family *Culicinae* is characterized by possessing the posterior cross-vein beyond the anterior does not seem to constantly apply, as this is not the case in the type specimen here described ; whilst I also possess a female *T. immisericors*, in which the posterior cross-vein, though approximate, is distinctly before the anterior.

Female.—Head : nape black with apple-green and blue flat scales behind occiput and over most of the surface, the posterior orbits fringed above with a single line of white scales, broadening on genæ. Two pairs of black vertical bristles, the median pair porrect, the outer more upward-directed. Basal joint of antennæ globular, black with whitish sheen at sides, the flagellum 14-jointed, brown, the first joint very small, clothed throughout with microscopic white hairs, in addition to the long dark verticils at the joints. Clypeus black, shining whitish viewed from before and above. Proboscis black, with metallic violet reflections. Palpi only as long as head, apparently 3-jointed, black with metallic blue reflections, purple at apex of first and second joints, the colouration extending over the second joint on to basal third

of apical segment, which has the tip yellowish, leaving only the middle third black. First and second segments approximately equal in length, apical short, slightly incurved, so that its tip touches the proboscis.

Thorax : shining black, clothed with flat metallic brassy scales, with a patch of brilliant scales at base of wings, blue before and green behind. There are some short black bristles over base of wings also. Behind the root of the wing is a præscutellar tuft of bright metallic yellow hairs, arising from the patch of coloured scales. Prothoracic lobes clothed with purple and greenish scales, bearing on anterior margin some long golden brown hairs. Scutellum very dark brown, with one or two flat brassy green scales on mid-lobe, and at tip of each side lobe. Border bristles brown ; pleuræ black with dense flat snowy white scales.

Abdomen : apically somewhat truncate, but not expanding. Dark brown mottled with paler yellow-brown scales, which form a broad dorsal band at junction of first and second segments. With the exception of this yellow band, the whole dorsal surface has metallic blue and purple reflections. Laterally the apical margin of the first with a large, and basal margin of the fourth, fifth, and sixth segments with a small, patch of creamy-white scales. Venter creamy-yellow, apex black.

Legs : coxa, trochanter, and most of femur creamy-yellow with purple scales exteriorly on apical two-thirds of fore femur, a line of such throughout exteriorly on mid-femur, and on apical one-third of hind femur ; tibiæ and tarsi black with a mottling of yellowish scales. Tibiæ with purple reflections.

Wings : small with dark brown scales, with a little purple reflection showing at the base of the first longitudinal vein. First, sub-marginal cell minute ; second, posterior cell barely one-third as long as its stem. A line of scales appears to carry the third longitudinal vein inward to a point well interior of the fork of the fifth vein. The basal erect portion of the third vein about three times its own length nearer the apex of the wing than the anterior cross-vein, which is small, in the type about its own length beyond the posterior cross-vein, in another specimen the posterior cross-vein is just beyond the

anterior. Posterior cross-vein inwardly sloped in both specimens. Halteres creamy-yellow. Length of type 6 mm. : of second specimen nearly 8 mm.

Described from a female in perfect condition taken at Suduganga, Matale District, Ceylon, flying in bungalow garden at 10 A.M., April 20, 1919. Another female taken on same estate, around *Lantana* scrub on boundaries, at dusk on March 30, 1919. Type and additional specimen in my own collection.

April 20, 1919.

R. SENIOR-WHITE, F.E.S.

The Tea Tortrix (*Homona coffearia*, Neitner).—Synonyms. *Tortrix coffearia*, Feld. in lit. Neitner. *Capua coffearia*, Neitner, Enem. Coff. Ceyl. 1861. *Pandemis* (? *Capua*) *menciana*, Walker, E. C. Cotes, Ind. Mus. Notes, Vol. III., No. 4, 1896. *Homona fasciculana*, Walker, List Lep. Het. Brit. Mus., Vol. 28, p. 424, 1863.

Male.—Gray. Head and thorax gray, densely scaled; eyes rufous; antennæ ciliated filiform, reaching to medial portion of wing; palpi short, curled, ascending, with appressed scales, terminal joint short; thorax with crest of scales on dorsal surface. Fore wing gray, narrow, with an oblique slightly sinuous medial band of light brown from costal margin to centre of dorsum; a dark gray punctum bordered with black at centre of costa; a sinuous brown band crossing apex from costa to termen; termen arcuate, fringed with gray scales; costal fold, curled towards the upper surface, densely scaled; 3 from angle, 7 and 8 stalked, 7 to termen. Hind wing unicolourous, dark gray, fringed, without basal pecten, 3 and 4 connate, 5 approximate to 4 at base, 6 and 7 stalked. Posterior tibia with a pair of medial spurs as well as an apical pair. 15 to 17 mm. expanded.

Female.—Ochraceous. Head and thorax ochraceous, eyes black, sometimes rufous; antennæ simple, filiform, as long as head and thorax, palpi as in male; thorax without crest. Fore wing ochraceous with a darker ochraceous patch on the shoulder, and oblique slightly sinuous medial band of the

same shade from costal margin to dorsum, a similar band across apex, borders of the atomi rufous; apex pointed, termen arcuate and fringed; no costal fold; venation as in male. Hind wing unicolourous, cupreus, fringed, venation as in male. The wings when at rest lie over the body. Their outline being of the same shape as the section of a bell. Posterior tibia with a medial as well as an apical pair of spurs. 25 to 28 mm. expanded.

Pupa: Naked. Thorax fulvous, darker on the dorsum; wing cases well defined and dark fulvous; ventral median area bronzus in male; eyes rufescent; abdomen tawny, dorsum adminiculate, adminiculæ transversely placed, rescuspate, two rows to each segment, with the exception of the penultimate and ultimate segments, anterior rows more developed than posterior; two dorso-lateral rows of cilia extending to the penultimate segment, each segment bearing four cilia; penultimate segment thinly cirrose, rescuspate; creamaster stout, flattened dorsally, eight-spined, four apically bifarious, a pair dorso-laterally, a pair ventro-laterally placed.

Male 7 mm. Female 11 mm.

N. K. JARDINE.

Report of the Proceedings of the Second Entomological Meeting, held at Pusa, February 5 to 12, 1917, edited by T. Bainbrigge-Fletcher, R.N., F.L.S., F.E.S., F.Z.S.—This publication justifies the claim made in the preface that it is “practically an abstract of our current knowledge of Indian crop pests.” In addition to this, it gives some idea how meagre our knowledge is, and how many are the gaps yet to be filled before it will be reasonably complete, even in the case of the commoner pests. To quote again from the preface, the report is “based partly on the notes prepared before the meeting was held, and partly on a running abstract made during the meeting.”

The book commences with a list of members and visitors who attended the meeting—twenty-six in all. A list of the coloured plates follows. There are no less than thirty-four of these depicting the life-histories of various major and minor pests. These plates are one of the most useful features

of the book, as they are well drawn and accurate, and should enable any one, whether with Entomological knowledge or not, to recognize their subjects, without difficulty, in the field.

An account is given of the combined Entomological and Mycological conference, at which were discussed various questions relating to the Madras Agricultural Pests and Diseases Act and the Rome Phytopathological Conference. Then follows the Chairman's opening address, in which the present state of Entomological knowledge in India is commented on, and many practical hints regarding the labelling of specimens and keeping of exact records are given. Various questions that need solving are briefly mentioned by way of stimulating research.

The various insects are treated of under the following headings :—(1) Pests of Hill Crops ; (2) Miscellaneous ; (3) Leguminous Field Crops ; (4) Oil Seeds ; (5) Malvaceæ ; (6) Non-Malvaceous Fibre Plants ; (7) Sugar Cane, Paddy, and other Cereals, Grasses, and Fodder Crops ; (8) Fruit Trees ; (9) Palms ; (10) Garden Plants ; (11) Drugs and Dyes ; (12) Cruciferous Crops ; (13) Other Vegetables and Condiments ; (14) Insect Pests of Stored Products.

Under these headings all the principal crops of India are gone over in detail, with a list of recorded pests divided into such sections as leaf-eaters, stem-borers, sucking-insects, &c., for each plant. The discussion on each pest is given. With so large an amount of work to get through in so limited a time, it is obvious that these discussions could not be very full, and there is inevitably a good deal of matter which contains very little information, but, nevertheless, the main facts concerning each insect seem to have been brought to light with great success. As many of the insects treated of are pests of several distinct crops, there is a considerable degree of repetition, but this is reduced to a minimum.

The name of each speaker is given in the margin opposite to his remarks. A very full index is given.

The notes on control methods are often meagre, except in the case of insects, which have received a good deal of attention from Entomologists. This is unfortunate, but it is probably

unavoidable, owing to the small amount of work that has been done in India on the testing of suitable insecticides and insecticidal methods. The main reason for this deficiency of knowledge is, of course, the difficulty of devising methods suited to the uneducated native cultivator, who cannot be induced to try anything in the way of a "new departure" in his cultural operations, unless its simplicity and efficiency are demonstrated to him in the clearest possible way.

The book forms an excellent companion and extension of the Editor's former volume, entitled "Some South Indian Insects and other Animals," and will prove a most useful addition to the library of any Economic Entomologist, whether professional or amateur, who works in India or the countries adjacent to it. It gives a very complete summary of the known pests of practically all the crops which are grown in India, and this information is given in a readily accessible form. Finally, the price is only Rs. 3, which, as in the case of "Some South Indian Insects," is astonishingly cheap, especially considering the number of coloured plates.

The Editor and his staff are greatly to be congratulated on the excellent work they have turned out.

G. M. HENRY.

Crocodiles' nesting Habits.—My personal experience of the nests of crocodiles is, I am sorry to say, limited to one, which was found near the resthouse at Horowapotana. It was situated on a small backwater of the tank, not far from the bund, in a position only slightly above the water level at the time, but apparently flooded at high-water level. The species must thus have been the Marsh Crocodile (*Crocodilus palustris*). In this case the parent certainly remained near the nest. We cautiously approached from behind the bund, and saw that the animal was actually over or very near the site of the nest. While we were watching another adult crocodile approached, for what purpose is unknown, but possibly for the purpose of robbing the nest. At any rate the parent at once attacked the intruder, and they had a tussle. As some of our party wanted to get a crocodile, they then fired, and both beasts

escaped into the water. We went up to the nest and had it dug up. The tracker who did it was very careful when he came to the eggs, as he said that he was afraid that some of the young crocs might have hatched out and would then bite him. The eggs, which numbered over thirty, were about six inches below the surface, and were not all heaped together. Possibly the arrangement was such as is described elsewhere, namely, laid around a central small mound, which causes the eggs to scatter in a circular layer as they are laid. They had a thick hard shell, and were about the size of a goose egg. Those we opened were all quite fresh, but our efforts to hatch them out after our return to Colombo failed, possibly owing to the vibration on the motor journey. I have spoken to another keen and reliable observer with regard to the nesting of the crocodiles on the south coast rivers and lagoons. His observations would refer to the Estuarine Crocodile (*Crocodilus porosus*). He states that the parent does not remain near the nest, but leaves the sun to do its work alone. Also the nests appear to be placed in very much drier ground, considerably above high-water level. Speaking of nests that he has observed when the young were on the point of hatching out, he states that it is quite easy to tell when the youngster is ready to come out, as it makes a cheeping noise, rather like that of a young chicken. It then breaks the shell by means of a temporary tooth developed at the end of the snout. When it emerges, the youngster does not at once make for the water, but stays near the nest for several minutes with its mouth wide open. If during this period it is put into the water, it at once comes out again and stays with its mouth open. After a certain time it goes down to the water and swims away, as an adult would. I presume that this action of the young crocodile in avoiding the water at first is due to the fact that in the egg its lungs are not expanded, and the interval with gaping mouth on dry ground is to give the lungs and the air tube, which runs up to the back of the nostrils, time to open and expand properly without any chance of their being choked with water.

October 8, 1918.

C. T. SYMONS.

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PROCEEDINGS OF THE CEYLON NATURAL
HISTORY SOCIETY.

Twenty-second General Meeting.

THE Twenty-second General Meeting of the Society was held in the Colombo Museum Library on May 22, 1918, at 5.15 P.M., Dr. A. Nell in the Chair.

A paper on the Mendelian theory was given by the Rev. Father M. J. Le Goc, O.M.I.

New Members :—Mrs. Sri Pathmanathan ; Leigh Smith, Esq., and A. C. Hayley, Esq.

Twenty-third General Meeting.

The Twenty-third General Meeting of the Society was held in the Colombo Museum on October 10, 1918, at 5.15 P.M., Dr. A. Nell in the Chair.

Dr. R. L. Spittel gave a paper entitled "Nuwaragala, and the Veddass of Henebeda," illustrated by lantern slides.

New Members :—A. M. Hurst, Esq., and H. Wicebloom, Esq.

THE PICARIAN BIRDS AND PARROTS OF CEYLON.

By W. E. WAIT, M.A., F.Z.S.

(With two Plates.)

THE present paper comprises the Picarian Birds and Parrots found in Ceylon. It includes all the Ceylonese species described in the third volume of birds in the Fauna of British India, with the exception of the Owls and Hawks. I have again to acknowledge my thanks to Mr. Stuart Baker for advice and for information on the nesting of many of the rarer species.

Order **PICI.**Family **PICIDÆ.**Sub-family *Picinæ.**Woodpeckers.*

The true Woodpeckers, together with two allied sub-families unknown in Ceylon—the Piculets and Wrynecks—form a well-marked family, which, by Blanford, has been placed in a separate order. They are found in the temperate and tropical regions all over the world, except in Madagascar, Australasia, and Polynesia, and are readily distinguishable by their outward form and habits, which do not vary greatly among the different species. The bill, which is generally strong and chisel-shaped, is used for cutting away the bark of trees in search of insects, and for excavating nest holes in tree trunks or branches. The tongue is peculiar, being of enormous length, and provided with glands secreting a sticky fluid, to which insects adhere. The foot is usually four-toed, and adapted for climbing. The arrangement of the toes is zygodactylic, i.e., the hallux or true hind toe and the fourth toe are directed backwards, the second and third toes

forwards. In one Ceylon genus, *Micropternus*, the hallux is rudimentary. The wings are short and pointed, and the flight undulatory. The tail feathers are twelve in number (the outermost pair being frequently concealed by the tail coverts), and are provided with stiff shafts. Woodpeckers seldom perch, but cling to trees in an upright position with the tail pressed as a support against the stem ; hence the tail feathers are often much worn. The birds generally alight at the foot of a tree and work their way up the trunk in a spiral, moving rapidly for a short distance, and then stopping to tap on the bark for insects. Their cry is generally a harsh scream, or in the smaller species a shrill trill. Their food consists wholly or mainly of ants and other similar insects. All Woodpeckers lay white eggs in a nest hole, which in nearly all cases is hollowed in the stem or branch of a tree. One genus, however, *Micropternus*, makes the nest hole in the interior of the hanging nest of a certain species of ant.

Nine species, divided among six genera, occur in Ceylon, two species being peculiar to the Island.

Rough Key to Ceylon Picinæ.

A.—Mantle green. Genus *Gecinus*.

(1) Length 11. Rump tinged with bright yellow.

Male : Crown and crest crimson.

Female : Crown and crest black.

Gecinus striolatus (The Little Scaly-bellied Green Woodpecker).

(2) Length 9·5. Rump green.

Male : Crown and crest crimson.

Female : Crown dark olive, crest crimson.

G. chlorogaster (The South Indian Yellow-naped Woodpecker).

B.—Mantle black and white.

(1) Length 7. A small crest, pale crimson in males, yellow in females.

Liopicus mahrattensis (The Yellow-fronted Pied Woodpecker).

- (2) Length 4·8. No crest. Males with a vermillion streak on side of occiput.

Iyngipicus gymnophthalmus (The Ceylon Pigmy Woodpecker).

- C.—Mantle dull rufous-brown barred with black. Feathers below the eye in males tipped with crimson.

Micropternus gularis (The Malabar Rufous Woodpecker).

- D.—Mantle wholly or in part either crimson or yellow.

- (a) Bill about 1·5; jaws, throat, and fore-neck black speckled with white. Genus *Brachypternus*.

- (1) Mantle yellow or orange, crest crimson. Forehead and crown in males black tipped with crimson, in females black with white spots.

B. aurantius (Golden-backed Woodpecker).

- (2) Mantle and crest crimson, bill blackish. Forehead and crown in males black tipped with crimson, in females black with white spots.

B. erythronotus (Red-backed Woodpecker).

- (b) Bill about 2; jaws, throat, and fore-neck white with five longitudinal black stripes. Genus *Chrysocolaptes*.

- (1) Wing coverts golden, a white triangular patch on hind-neck and upper back. Crest crimson in males, yellow in females.

C. festivus (The Black-backed Woodpecker).

- (2) Mantle crimson, bill greenish-white. Crown and crest crimson in males, black with white spots in females.

C. stricklandi (Layard's Woodpecker).

(*GECCINUS STRIOLATUS* (Blanford, Vol. III., p. 20 ;

Legge, p. 194).

The Little Scaly-bellied Green Woodpecker.

Description.—Male : Crown and crest crimson ; general colour of upper parts olive tinged with green ; rump and upper tail coverts bright yellow, sometimes tinged with orange. Wing quills dusky brown with white bars on the inner webs ; the primaries have white spots on the outer webs, and the outer webs of the secondaries are washed with green. Tail blackish-brown with indistinct lighter bars towards the base. On the eyebrow a white strip runs back to the nape, it is bordered above by a black stripe extending forward to the nostrils ; lores and cheeks dirty white, the cheeks with darker streaks ; ear coverts streaky gray. Chin and throat yellowish-white with darker centres to the feathers and black streaks along the jaw. Under parts greenish-white, each feather with a dark V-shaped band near the margin, and some feathers with dark shaft stripes.

Female : Differs only in the crown and nape, which are black streaked with ashy-brown.

Bill dusky horn colour, the greater part of the lower mandible yellow ; iris red with an outer ring of white ; legs and feet dusky green.

Length 11 ; wing 5·2 ; tail 3·75 ; tarsus 1·00 ; bill from gape 1·5.

Distribution.—Rare in Ceylon, and apparently found only on the higher patanas of the Central Province and Uva. In India it occurs in forest country on the Malabar Coast and on the eastern side of the peninsula north of the Godaveri. It is also met with in the Eastern Himalayas, North Burma, and Siam.

Habits, &c.—This species may be looked for on patanas which are thinly dotted with trees and in the intersecting ravines where wooded. The eggs do not appear to have been found in Ceylon as yet. In India the birds breed from March to May, making the usual nest hole in trees, and laying four to five glossy white eggs, averaging 1·05 by ·8.

GEINUS CHLOROGASTER (Blanford, Vol. III., p. 25).

CHRYSOPHLEGA XANTHODERUS (Legge, p. 197).

The South Indian Yellow-naped Woodpecker.

Description.—Male: The feathers of the forehead, crown, crest, and a stripe down the jaw crimson with greenish-black bases; nape yellow. Upper plumage and wing coverts olive-green, the greater coverts golden-olive. Wing quills dark brown with some white spots; the outer webs of the inner primaries and secondaries orange-red bordered with bronze-green; tail black. Lores dusky; face, throat, and under parts dull green; the throat, abdomen, and flanks more or less barred with white; the breast generally unspotted.

Female: Forehead and crown dark olive, the crimson cheek stripe is wanting, otherwise it resembles the male.

Bill blackish, the sides of the lower mandible and the edge of the upper mandible near the gape yellowish; iris brownish-red; legs greenish-olive.

Length 9·5; wing 4·65; tail about 3·50; tarsus ·80; bill from gape 1·0; females are a little smaller.

Distribution.—Apparently confined to the southern half of the Island. It is found in the Western Province and Galle District. I have occasionally seen it north of Tangalla, and it occurs in the Eastern Province. It is also met with in the hills, mainly in Sabaragamuwa and Uva. In India it occurs on the Malabar Coast and the Western Ghats up to 5,000 feet.

Habits, &c.—Rather a shy bird, found in forest country, especially near streams, and in decayed gardens where there is plenty of undergrowth. It may sometimes be seen on the ground breaking open dried cowdung in search of beetles. It feeds also on ants.

In India this species breeds about March and April, making the usual nest hole in a tree in the jungle. One to three, but generally two, white eggs are laid. The texture is hard and glossy, the shape a long oval. Average measurement about 1 by ·74.

LIOPICUS MAHRATTENSIS (Blanford, Vol. III., p. 43;
Legge, p. 184).

The Yellow-fronted Pied Woodpecker.

Description.—Male : Forehead and front of crown shining straw colour, remainder of crown with the crest pale crimson ; nape and hind-neck smoky brown ; back and scapulars white, much mixed with black ; wing coverts, wing quills, and tail black, largely spotted or barred with white ; rump and upper tail coverts white, the latter with broad arrow-shaped black markings. Sides of face, chin, throat, and fore-neck white ; a broad brown stripe runs from below the ear coverts down the sides of the breast ; remainder of lower parts white streaked with brown, the centre of the abdomen being stained with crimson.

Female : The whole of the top of the head, including the crest, straw yellow.

Bill dusky bluish, darker on the ridge and at the tip ; iris deep red ; legs and feet lead colour.

Length 7 ; wing 3·80 ; tail 2·5 ; tarsus ·7 ; bill from gape 1·05.

Distribution.—This little Woodpecker is nowhere very common. Its chief haunts are in the Mannar and Jaffna Districts. Thence it appears to have worked its way east and south, as it occurs in the Eastern Province and parts of the Hambantota District, and on the patanas in the drier parts of Uva and the Central Province. It is found in India in suitable places here and there throughout the peninsula, in the valleys at the base of the Western Himalayas, and the drier parts of Upper Burma.

Habits, &c.—This species haunts low jungle and scrub, being especially fond of Euphorbia trees. The note is a weak trill. I have known it to breed in the Mannar District in May, and near Hambantota in July. The nest is a small hole in the stem or branch of a decaying tree.

The three white eggs average about ·87 by ·68.

Note.—*Dendrocopus macii* (The Fulvous-breasted Pied Woodpecker) is said by Kelaart to have occurred in Ceylon,

but his identification was probably incorrect, as the species is restricted to the base of the Himalayas, Lower Bengal, and parts of Assam.

It is slightly larger than *L. mahrattensis*, which it somewhat resembles in build, but has no crest. It may be distinguished by the uniform black of the hind-neck, upper back, and upper tail coverts, and by the bright crimson of the vent and lower tail coverts. The top of the head is crimson in males and black in females.

Length 7·5 ; wing 4·3.

LYNGIPIOUS GYMNOPTHALMUS (Blanford, Vol. III., p. 48 ;
Legge, p. 186).

The Ceylon Pigmy Woodpecker.

Description.—Male : The top of the head, the centre of the nape, and the hind-neck very dark brown ; a broad white stripe runs from behind the eye to the nape, and is bordered above by a streak of vermilion. Remainder of upper plumage dark brownish-black ; the back is barred, and the wing quills, wing coverts, and tail are spotted with white. The cheeks, ear coverts, and sides of the neck are brown. Under plumage dirty white, faintly streaked with brown in young birds : under tail coverts streaked with brown.

Females lack the vermilion stripe over the eyebrow.

Bill olive-brown, paler underneath ; iris white, at times tinged with gray, yellow, or red ; legs and feet greenish.

Length 4·8 ; wing 3 ; tail 1·25 ; tarsus ·58 ; bill from gape ·62.

Distribution.—Found nearly all over the low-country, except in the extreme north, and in the hills up to about 3,000 feet, occasionally higher. In India it occurs on the Malabar Coast.

Habits, &c.—This, the smallest of our Woodpeckers, frequents the top branches of trees. Its presence is generally betrayed by its note, a shrill long trill. It makes its nest hole in small dead branches, laying probably three white eggs, which measure about ·62 by ·53.

MICROPTERNUS GULARIS (Blanford, Vol. III., p. 57 ;
Legge, p. 200).

The Malabar Rufous Woodpecker.

Description.—Male : General colour dull rufous ; head and cheeks dark brown, the feathers from the gape beneath the eye to the ear coverts tipped with crimson. The upper plumage from the hind-neck to the tail is barred with black.

The chin and throat feathers have broad darker borders and faint whitish edges. The remainder of the lower plumage is almost uniform rufous-brown with indistinct black bars on the flanks and thighs.

Females have no crimson tips to the cheek feathers.

Bill dull black, paler beneath ; iris deep brown ; legs and feet slaty-black.

Length 9·5 ; wing 4·75 ; tail 2·75 ; tarsus ·75 ; bill from gape 1·2.

Distribution.—Fairly well distributed throughout the low-country, and on the lower hills up to about 2,000 feet. In India its range is restricted to the forest tracts of the Malabar Coast.

Habits, &c.—This species is found in forests or well-wooded gardens. It feeds mainly on ants, and occasionally may be seen on the ground in search of its food.

The nest has not yet been recorded from Ceylon, but in India the breeding season is during April and May. The nest hole is excavated in the interior of large hanging ants' nests. Three fragile, glossless, white eggs are laid, measuring about 1·12 by ·68.

BRACHYPTERNUS AURANTIUS (Blanford, Vol. III., p. 58).

BRACHYPTERNUS PUNCTICOLLIS (Legge, p. 205).

The Golden-backed Woodpecker.

Description.—Male : Pale form. Feathers of forehead and crown black with crimson tips ; crest crimson ; a fairly broad stripe runs from over the eye to the nape, another broad white stripe extends from the nostrils across the cheek and broadens down the side of the neck. The sides of the head between these two stripes are streaky black and white. The hind-neck,

upper back and primary coverts, rump, tail coverts, and tail are black ; scapulars and middle of the back golden-yellow ; a portion of the wing coverts and the outer webs of the secondaries golden-olive ; primary quills and inner webs of secondaries black with white spots ; the wing coverts are also more or less spotted with yellowish-white. The jaws, chin, throat, and fore-neck are black, speckled with white ; the lower neck and upper breast mainly black. The rest of the lower surface, with the upper flanks whitish, more or less tinged with tawny buff, each feather margined with black, most heavily on the breast ; the lower flanks and under tail coverts barred with black.

Forest Race : The yellow of the back and wings is tinged more or less with orange, or even red ; some specimens are so red that they are probably hybrids between this and the next species.

Female : The feathers of the forehead and crown are black with terminal white spots, the crest is crimson as in the male.

Bill slaty-black ; iris reddish-brown ; legs and feet dark green.

Length about 10·5 ; wing 5·25 ; tail 3·5 ; tarsus ·8 ; bill from gape 1·5.

Distribution.—Occurs only in the northern half of the Island. The palest specimens come from the Jaffna peninsula and the scrub country adjoining the coast of the Northern Province. In the jungles of the North-Central Province the specimens are much darker, and appear to interbreed with the red-backed species *B. erythronotus*.

In India the present species is found over the greater part of the continent westward of Assam.

Habits, &c.—A common bird in the north of the Island, occurring in coconut and palmyra groves, village gardens, scrub jungle, and forest.

It is usually seen in pairs. The nest is the usual hole in the stem of a tree. The breeding season is about April. Three rather glossy white eggs are laid, measuring about 1·10 by ·8.

BRACHYPTERNUS ERYTHRONOTUS (Blanford, Vol. III., p. 60).

BRACHYPTERNUS CEYLONUS (Legge, p. 202).

The Red-backed Woodpecker.

Description.—In the typical form from the south of the Island, where *B. aurantius* is not found, the present species differs from the last named as follows :—The middle of the back and the scapulars are bright crimson, the wing coverts and outer webs of the secondaries are duller crimson, while the black of the lower back and rump is faintly tinged with the same colour ; the spots on the wing coverts are, as a rule, fewer and tinged with the colour of the mantle, they may be almost absent ; the white stripes above and below the eye are considerably reduced in breadth. In the north of the Island, where both species are found together, the Red-backed Woodpecker approaches the Golden-backed form more nearly. The crimson of the mantle is tinged with orange, and the white stripes down the head and neck are more conspicuous. Some specimens seem to be undoubted crosses.

The sexual differences in plumage are as in *B. aurantius*.

Bill blackish ; iris red ; legs and feet dusky green.

Length about 11·5 ; wing 5·5 ; tail 4 ; tarsus ·7 ; bill from gape 1·5.

Distribution.—Peculiar to Ceylon. Found all over the low-country, except in the extremely dry maritime coast tracts of the north-west and south-east. It ascends the hills to about 4,000 feet.

Habits, &c.—This is the most abundant of our Woodpeckers, being equally common in plantations and forest. It always alights near the bottom of a tree and works its way spirally to the top, tapping the trunk for insects. It feeds largely on red ants. The flight is undulatory and jerky ; the cry a loud harsh scream. The breeding season is from about March to June, and again in September. The nest is the usual hole in the stem of a decaying coconut or other tree. The three eggs in appearance closely resemble those of the last species, and have approximately the same measurements.

CHRYSOCLAPTES FESTIVUS (Blanford, Vol. III., p. 64 ;
Legge, p. 191).

The Black-backed Woodpecker.

Description.—Male : Forehead brownish with large white spots ; crown and crest crimson bordered by a black stripe ; a broad white stripe runs from behind the eye to the nape, and expands into a triangle of white on the hind-neck and upper back. The rest of the back, the scapulars, rump, upper tail coverts, and tail are black, as are the smaller wing coverts on the forearm. The remainder of the wing coverts are black at the base, the exposed portions being golden-olive with bright golden-yellow fringes. The outer webs of the secondary quills are golden-olive ; remainder of wing quills brownish-black, the outer webs with light brown or greenish, and the inner webs with large white spots. A broad black stripe runs from the eye down the side of the neck. The jaws, chin, throat, and fore-neck are white with five longitudinal black stripes. The under parts are white streaked with black, most heavily on the breast.

Female : The fore part of the crown, as well as the forehead, is speckled black and white, the rest of the crown and crest are light golden-yellow.

Bill blackish ; iris crimson ; legs slaty-greenish.

Length about 12 ; wing 5·8 ; tail 3·5 ; tarsus 1·1 ; bill from gape 2.

Distribution.—A rare bird, found in a few forest localities in the northern half of the Island. Legge met with it also near Tissa in the Hambantota District. In India it is locally distributed throughout part of the peninsula, but is everywhere rare.

Habits, &c.—I have come across several small colonies of this species in the North-Central Province and Puttalam District always in large trees, and generally in the “*tisbamba*,” or clearing, round isolated villages in the jungle. They nest high up in large trees, and, to judge from the number of holes, make a fresh nest every year. Apparently they roost in these nest holes. The breeding season is in March, and again in August. I once obtained an addled egg on April 1 from a

nest in which there were two young ones, and again found a single young bird in September.

The birds thus seem to have two broods and to lay from one to three eggs.

The single egg in my collection is rather elongated, measuring 1·25 by ·88. The texture almost exactly resembles that of celluloid.

CHRYSOCOLAPTES STRICKLANDI (Blanford, Vol. III., p. 67 ;
Legge, p. 188).

Layard's Woodpecker.

Description.—Male : Forehead dark brown ; crown and crest crimson ; hind-neck blackish with large white spots ; back, rump, wing coverts, and outer webs of secondaries crimson, the colour being brightest on the rump ; primaries and inner webs of secondaries blackish-brown with white spots ; tail coverts and tail black. A row of white spots passes from behind the eye above the ear coverts to the hind-neck ; cheeks and sides of head and neck blackish-brown. The jaws, chin, throat, and upper fore-neck are white, at times tinged with buff, with five black longitudinal stripes. The feathers of the breast and lower fore-neck are white with broad black borders, giving a scaly appearance ; remainder of lower parts more streaky black and white ; under tail coverts barred black and white.

Female : The whole of the top of the head above the eyes, together with the nape and hind-neck, are black with white spots ; the hindmost under tail coverts are dark brown.

Bill mainly greenish-white, darker at the base ; iris yellowish-white ; legs and feet greenish-slate colour.

Length about 11·5 ; wing 5·15 ; tail 3·5 ; tarsus 1·05 ; bill from gape 2.

Distribution.—Peculiar to Ceylon ; found practically all over the Island in suitable forest country, but never so abundant as the two species of *Brachypternus*.

Habits, &c.—A bird usually found in tall forest ; in wilder districts it occasionally visits large trees in gardens. The flight is more rapid than that of the common Red-backed Woodpecker, and the note is a thin shrill trill.

It would appear to have much the same nesting habits as *C. festivus*. The first brood is hatched early in the year, and I once found an addled egg with two young ones in September. Oftener only one egg is laid.

The eggs measure about 1·16 by ·86.

Order **ZYGODACTYLI.**

Family CAPITONIDÆ.

Barbets.

The Barbets are found in the tropical regions of Africa, Asia, and America. Four species occur in Ceylon; two of them are peculiar to the Island. In general structure and nesting habits they are akin to Woodpeckers, but they feed almost entirely on fruit, and perch on branches, instead of clinging to the stem in a vertical position. The bill is generally stout, slightly curved, and fairly powerful. Prominent bristles overhang the nostrils and spring from the chin. The wings are short and rounded; the tail is short and soft and composed of ten feathers.

As in the Woodpeckers, the feet are zygodactylic, the first and fourth toes being directed backwards. The cry is a peculiarly monotonous call of from one to three syllables repeated at intervals. The nest hole is like that of a Woodpecker, the entrance being generally neatly bevelled and rounded.

The eggs are of a dull glossless white.

In all Ceylon species the plumage is mainly green. The short wing quills and soft but rather scanty plumage give the birds the appearance of not being quite fledged.

Rough Key to the Ceylon Capitonidæ.

A.—Larger forms; length over 8 inches; no crimson on head and neck.

(1) Length 9·75; whole head and neck brown with pale streaks.

Thereiceryx zeylonicus (Common Indian Green Barbet).

(2) Length 8·5; cheeks, chin, and throat blue.

Cyanops flavifrons (Yellow-fronted Barbet).

B.—Smaller forms under 7 inches ; patches of crimson on head and neck.

(1) Throat yellow ; cheeks black.

Xantholæma hæmatocephala (Crimson-breasted Barbet).

(2) Throat orange ; cheeks blue.

X. rubricapilla (Small Ceylon Barbet).

THEREICERYX ZEYLANICUS (Blanford, Vol. III., p. 86).

MEGALÆMA ZEYLANICA (Legge, p. 208).

The Common Indian Green Barbet.

Description.—Head, neck, breast, and sometimes the upper abdomen umber-brown, each feather with pale shaft-stripes, on the head these stripes are not very distinct. Back, wing coverts, and tail grass green, the mantle with a few pale streaks and the wing coverts tipped with small white spots. Wing quills brown with pale inner margins, the outer webs green, except on the first few primaries.

On the abdomen the brown of the chest gradually merges into the pale grass green of the flanks and lower tail coverts ; under surface of tail bluish.

Bill orange-brown ; iris red-brown ; a circle of naked yellow skin round the eye ; legs and feet light brownish-yellow.

Length about 9·75 ; wing 4·37 ; tail 3 ; tarsus 1·2 ; bill 1·60.

Distribution.—Common over nearly all the low-country, except in the arid maritime districts and the dense forest tracts of the wet zone. It ascends the hills to three or four thousand feet. Blanford unites in one species the northern form, *T. caniceps*, which ranges over the greater part of India proper, and the southern race, *T. zeylonicus*, a smaller and darker form, which is confined to Travancore and Ceylon.

Habits, &c.—This species is very common in village gardens and thin jungle, chiefly near cultivation. It feeds largely on various species of wild fig. The nest hole is hollowed out of a rotten tree, or even a fence post. The three dull white eggs

are usually laid on a few stalks of dried grass which line the bottom of the cavity. Their average size is about 1·23 by ·87.

There appear to be several broods, as I have taken eggs as early as March and as late as August.

CYANOPS FLAVIFRONS (Blanford, Vol. III., p. 94).

MEGALÆMA FLAVIFRONS (Legge, p. 212).

The Yellow-fronted Barbet.

Description.—The forehead, front of crown, and a spot below the gape golden-yellow; top of the head brownish-green, passing into the grass-green of the remainder of the upper plumage: the feathers of the nape and of the back and sides of the neck have pale shaft-stripes. Wing quills brown with pale yellow inner margins, the outer webs of all but the first few primaries green. Eyebrows, lores, checks, ear coverts, chin, and throat verditer-blue; rest of lower plumage pale green, the breast feathers bordered, and the flanks and abdomen washed with emerald green; under surface of tail shot with blue.

Bill greenish horn colour, darker by the nostrils; iris light red; legs and feet greenish, sometimes bluish.

Length 8·5; wing 3·5; tail 2·30; tarsus ·9; bill from gape 1·1.

Distribution.—Peculiar to Ceylon. Found chiefly in the hill zone, except at the highest altitudes. From the bases of the hills it spreads into the damp low-country zone, being found in most parts of the Western Province, Sabaragamuwa, and the Galle and Kurunegala Districts. In the drier forest region it is more restricted, but is found locally in parts of the Eastern Province and the district north of the Matale hills.

Habits, &c.—Chiefly a forest bird, keeping to the tops of trees and feeding on fruit. It is very noisy in the mornings and evenings. The call is something like that of the preceding species, but more shrill. The birds breed in almost every month of the year. The nest hole is usually excavated in a soft-wooded tree. Two or three eggs are laid on the bare wood. They are white and smooth in texture, and generally slightly pointed at each end. Average size 1·10 by ·80.

XANTHOLÆMA HÆMATOCEPHALA (Blanford, Vol. III., p. 98).

XANTHOLÆMA HÆMOCEPHALA (Legge, p. 218).

The Crimson-breasted Barbet; Copperemith.

Description.—Lores black; forehead and crown crimson; top and sides of head, hind cheeks, and a stripe forward along the jaw to the lower mandible black; a patch above and below the eye, the chin, and throat yellow; nape and sides of neck grayish-green; remainder of upper plumage dull olive-green; tail and outer web of most wing quills bluish-green, the outer primaries and the inner webs of the remaining wing quills blackish with pale yellow edges. On the lower throat is a crimson patch, bordered behind by a wash of yellow; rest of lower plumage and the flanks whitish streaked with dull green.

Bill black; iris reddish; legs and feet coral red.

Length about 6; wing 3; tail 1·5; tarsus ·8; bill from gape ·9.

Distribution.—Found all over the drier parts of the low-country, and in the adjoining hills up to about 2,000 feet. It occurs practically all over the Indian Empire, except on the hills, and ranges east and south-east to the Malay Peninsula, Sumatra, and the Philippines.

Habits, &c.—Common in almost every village garden in the localities in which it is found, also in thin jungle, especially near cultivation. It is a great fruit-eater. It gets the name of Copperemith from its cry (wonk-wonk-wonk slowly repeated), which resembles the tapping of a hammer on copper.

The breeding season lasts from January to June. The nest is a small hole in a decaying branch or rotten fence post. Three dull, white, glossless eggs are laid on the bare wood at the bottom of the cavity. Like nearly all white eggs, they have a pinkish tinge when fresh and unblown. They are large for the size of the bird, measuring about ·99 by ·69.

XANTHOLÆMA RUBRICAPILLA (Blanford, Vol. III., p. 100;

Legge, p. 215).

The Small Ceylon Barbet.

Description.—A narrow black line across the base of the forehead; remainder of forehead and the front of the crown crimson bordered behind by a black band which passes behind

the eye to the cheeks; a stripe above and a patch below the eye, together with the chin and throat, bright orange. Remainder of upper plumage dark green, tinged on the top of the head with blue; the outer web of most wing quills bluish-green, the outer primaries and the inner webs of the remaining quills black with white inner margins. Hind cheeks, ear coverts, and sides of neck bluish; a small crimson patch on the lower throat fringed behind with orange. The bases of the throat feathers are black. Lower parts from breast pale green, often with a bluish tinge.

Bill black; iris red-brown; legs and feet coral-red.

Length 6; wing 3·1; tail 1·4; tarsus ·75; bill from gape ·85.

Distribution.—Peculiar to Ceylon. It replaces the last species in the damp parts of the low-country, where it is commonest, and is found in the hills up to about 4,000 feet. It also extends locally into the dry zone, except in the arid maritime districts. It is, however, occasionally found in the Jaffna peninsula.

Habits, &c.—Like the last species, this bird is common in gardens and compounds, but in the north and east it is rather more partial to wild fruit trees in the forest. The call is quicker and sharper than that of the Coppersmith. The breeding season is from about March to June. The nest is the usual small round hole in the dead branch of a living tree. The eggs resemble those of the last species, but are slightly smaller, averaging ·9 by ·65.

Order **ANISODACTYLI.**

In the classification adopted by Blanford, who in this respect follows Gadow, the above order comprises five sub-orders: *Coraciæ*—Rollers; *Meropes*—Bee-eaters; *Halcyones*—Kingfishers; *Bucerotes*—Hornbills; and *Upupæ*—Hoopoes. This order thus comprises birds which in outward appearance seem to have little in common, but all have the same structure of palate, that known as desmognathous, a hallux or hind toe is always present, while the three front toes are more or less joined at the base.

All members of the order lay white eggs in a nest hole, which may be hollowed out either in a tree or in the ground, and in all cases the young when hatched are naked.

Sub-order CORACIÆ.

Family CORACIADÆ.

The Rollers.

The Rollers are birds mainly of brilliant plumage found throughout most parts of the Old World. In build and in the shape of the bill they resemble crows. The soles of the feet, however, are flat, and the three front toes more or less united at the base. The flight is buoyant, with vigorous flaps of the wings, and at intervals curious turnings and tumblings, which have given the birds their English name. The nest is placed in the hole of a decaying tree, and the eggs are white and glossy. Two genera are found in India: *Coracias*—the true Rollers, and *Eurystomus*—the Broad-billed Rollers. One species of each genus occurs in Ceylon.

Rough Key to Ceylon Coraciadæ.

A.—Plumage gay; bill twice as long as broad. Throat and fore-neck lilac with buff shaft-stripes.

Coracias indica (The Indian Roller).

B.—Plumage more sober; bill as broad as long. Throat and fore-neck washed with royal blue in adults.

Eurystomus orientalis (The Broad-billed Roller).

CORACIAS INDICA (Blanford, Vol. III., p. 103 ;

Legge, p. 281).

The Indian Roller.

Description.—A small patch above the nostrils sandy buff, at times tinged with violet; crown and nape bluish-green, tinged above the eyes with turquoise-blue; hind-neck and sides of neck brownish-lilac; back, scapulars, and innermost wing quills dull greenish-brown; lower back and tail coverts deep purple-blue, the former tinged with greenish-blue. Middle tail feathers dark dull green washed with purple-blue at the base; rest of tail deep purple-blue with a broad band of turquoise-blue on the outer half. Innermost wing coverts deep purplish-blue, most of the remainder greenish-blue, the primary coverts, the tips of the secondary coverts, and the

edge of the wing being turquoise ; wing quills deep purplish-blue tipped with dusky brown and with a broad band of turquoise across the six outer primaries. Chin sandy buff ; throat and sides of the head purplish-lilac with broad pale shaft-stripes ; breast lilac-brown ; abdomen, wing lining, thighs, and lower tail coverts pale greenish-blue.

Bill blackish-brown ; iris grayish-brown ; eyelids and naked skin round eye pale orange-yellow ; legs and feet brownish-yellow.

Length 13 ; wing 7 ; tail 4·75 ; tarsus ·9 ; bill from gape 1·70.

Distribution.—Found chiefly in the drier northern half of the Island ; during the north-east monsoon it wanders south to the Western Province and Ratnapura District, where it also occasionally breeds. Occurs in suitable localities over most of India, but avoids the hills, thick forests, and deserts. It straggles westwards to Asia Minor.

Habits, &c.—Generally seen in open compounds, round paddy fields, or near the borders of tanks. It is extremely fond of perching on dead trees or telegraph wires. The cry is a harsh grating call. The bird feeds largely on insects. The breeding season extends from January to June. The nest is a hole generally in a rotten tree, sometimes in an old wall. It is lined with a modicum of grass or vegetable fibre. The eggs generally number four, sometimes five. They are almost round and of a glossy china white. Average size of a small Ceylon series 1·38 by 1·10.

EURYSTOMUS ORIENTALIS (Blanford, Vol. III., p. 107 ;

Legge, p. 285).

The Broad-billed Roller.

Description.—Head, face, and chin rusty black, slightly tinged on the nape with green. Rest of upper plumage dark dull green, with a tinge of dark blue on the rump, tail coverts, and wing coverts. Primary coverts deep blue ; quills black, washed with deep blue on the outer webs ; outer primaries crossed with a broad band of turquoise-blue ; tail black, washed on the outer half with deep blue, the basal portion of the central feathers shading into the dark blue-green of the

tail coverts. Throat and fore-neck rusty greenish-black, a patch of varying size on the centre of the throat and neck washed with royal blue, which is brightest on the shafts of the feathers. Remainder of lower parts greenish-blue, darker on the breast.

Bill deep orange-red, the extreme tip blackish-red, in young birds wholly black; iris dark brown; legs and feet orange-red.

Length 11·5; wing 7·25; tail 4; tarsus ·75; bill from gape 1·5.

Distribution.—One of our rarest residents; has been found in thick forest in various scattered localities in the Island.

The southern form of this species—*H. lætior* of the British Museum Catalogue—occurs in Ceylon and Travancore. It is darker than the northern forms, which range along the base of the Eastern Himalayas through Burma to China and Malaya. Blanford unites all these forms into one species.

Habits, &c.—Essentially a forest bird, frequenting tall dead trees in deep jungle. The food appears to consist mainly of wood-boring beetles. In Travancore this species has been found breeding from September to April in a hole in a large tree at a great height from the ground. The three white eggs measure about 1·38 by 1·15, but vary considerably in shape and size.

Sub-order MEROPES.

Family MEROPIDÆ.

Bee-eaters.

The Bee-eaters are a single family found throughout the greater part of the Old World. They are slim-built smallish birds, the plumage—with certain African exceptions—being mainly or largely of some shade of green. The bill is long, slender, pointed, and gently curved; the wings are long and pointed; the legs and feet are weak. The three front toes are syndactylic, *i.e.*, united at their bases between the inner and middle toes along the basal joint, between the middle and outer toes up to the last joint. In all Ceylon species the nostrils are partially covered with plumes, and there are a few small rictal bristles at the base of the bill.

All species feed on insects, chiefly bees and wasps, which they capture on the wing with an audible snap of the beak. They generally keep a lookout for their prey from a perch on a telegraph wire, railing, or twig, and after making a short swoop return to their starting point. The nest is a small unlined chamber at the end of a long burrow excavated in the bank of a river or roadside ditch. At times the little tunnel is driven at a gentle slope into almost level ground. The eggs are white, glossy, and nearly globular. Three species are found in Ceylon: one is migratory, two belong to the genus *Merops*, one is a *Melittophagus*.

Rough Key to Ceylon Meropidæ.

A.—Middle pair of tail feathers in adults much longer than the others. Genus *Merops*.

(a) Wing 3·65; chin and throat bluish-green.

Merops viridis (Common Indian Bee-eater).

(b) Wing 5·25; chin yellow, throat chestnut.

M. philippinus (Blue-tailed Bee-eater).

B.—Middle pair of tail feathers not elongated. Genus *Melittophagus*.

Wing 4·2; chin and throat saffron-yellow, fore-neck chestnut.

M. swinhoii (Chestnut-headed Bee-eater).

MEROPS VIRIDIS (Blanford, Vol. III., p. 110;

Legge, p. 309).

The Common Indian Bee-eater.

Description.—Upper plumage green with a bronze tinge, most pronounced on the crown and nape, which at times are almost golden-brown; tertiaries, rump, and tail coverts often washed with greenish-blue. Wing quills pale rufous on the inner, and greenish-bronze on the outer webs, the tips and shafts black; tail bronze-green, the outer half of the long central feathers and the tips of the remainder black. There is a black band from the nostrils through the eye to the ear

coverts. Chin, cheeks, and throat greenish-blue ; a black band across the fore-neck ; lower parts green, the lower tail coverts and vent much paler.

Bill black ; iris red ; legs and feet brown.

Length 9·5 to 10·5 ; wing 3·65 ; tail, outer feathers 2·85, central feathers up to 5·25 ; tarsus ·4 ; bill from gape 1·4.

Distribution.—Common throughout the drier parts of the low-country, especially in the sandy tracts round the coast in the north-west and south-east. It avoids the damp low-country, and seldom ascends higher than 1,000 feet. It occurs almost throughout India and Burma, and extends through Southern Persia to North-East Africa.

Habits, &c.—Those of the family. May commonly be seen perching on a rail or low branch, from which it makes frequent short flights. The cry is a not unpleasant chirrup. I have often seen it hawking for insects over small sheets of water. The breeding season is from April to August. The nest hole is run almost horizontally into any little hummock of sandy soil, frequently along the side of a road or path.

Three to five eggs are laid in a small circular chamber at the end of a passage 2 to 4 feet in length. They are glossy white, almost spherical, and average ·79 by ·70.

MEROPS PHILIPPINUS (Blanford, Vol. III., p. 3 :

Legge, p. 306).

The Blue-tailed Bee-eater.

Description.—Upper plumage, together with the wing coverts, brownish-green, darkest on the crown and nape, and shading on the lower back and tertiaries into the bright blue-green of the rump and tail ; the elongated central pair of tail feathers tipped with black. Primary and secondary quills pale cinnamon on the inner margin, the remaining portion bronze-green, brightest on the outer web, tips blackish. From the nostrils through the eye to the ear coverts runs a black streak, bordered above by a narrow pale blue line, and below by a broader line of the same colour ; chin pale yellow, throat chestnut, shading on the breast into green, which again passes into pale blue on the vent and lower tail coverts ; wing lining light rufous-brown.

Bill black : iris crimson ; legs and feet blackish.

Length about 12 ; wing 5·25 ; tail, outer feathers 3·5, central pair 5 to 6 ; tarsus ·5 ; bill from gape 2.

Distribution.—A migrant species, arriving about the end of August and leaving in April. It spreads fairly well all over the low-country, and is found in the patanas up-country to about 5,000 feet. It occurs over a great part of the Indian Empire, being partially migratory in many districts, and extends almost throughout the Oriental region.

Habits, &c.—In Ceylon it is found chiefly in open country, or about paddy fields, swamps, and hill patanas. Its habits are much the same as those of the last species. Its note is rather fuller and louder. Just before leaving the Island it collects in large flocks. It has not been known to breed in Ceylon.

MELITTOPHAGUS SWINHOEI (Blanford, Vol. III., p. 114).

MEROPS SWINHOEI (Legge, p. 313).

The Chestnut-headed Bee-eater.

Description.—Forehead, head above the eyes, hind-neck, and upper back chestnut ; a black streak runs from the gape of the bill under the eye to the ear coverts. Wing, wing coverts, and scapulars green, the primary and secondary quills with black tips and rufous inner margins ; rump and upper tail coverts pale blue ; tail green, the margins and tips of all but the central pair of feathers blackish ; chin and throat saffron-yellow ; fore-neck chestnut, bordered below by a black gorget band ; breast greenish, the tips of the feathers across which the black gorget runs are washed with pale yellow ; abdomen and lower tail coverts bluish-green.

Bill black ; iris crimson ; legs and feet dark brown.

Length 8·5 ; wing 4·2 ; tail 3·25 ; tarsus ·43 ; bill from gape 1·7.

Distribution.—Rather locally distributed ; it is common on the banks of the Gin-ganga in the Galle District and on some rivers in the Western Province. Scattered colonies are also found in the North-Western Province, Sabaragamuwa,

and Hambantota District, while a few birds may be seen here and there in the northern forest tract. It is more common in the central hill zone up to a moderate height.

It occurs on the Malabar coast and the Nilgiris, and also ranges from the Lower Himalayas through Assam and Burma to Malaya and Cochin-China.

Habits, &c.—This species is generally to be found on the banks of rivers, round tanks, or in forest country. It generally perches on the upper branches of trees. The birds occasionally fish for insects and small fry on the surface of water. They breed about April, excavating a long tunnel in the sandy bank of a river or tank bund. The eggs are laid in a circular chamber at the end of the passage. They are glossy white and spherical, averaging $\cdot 87$ by $\cdot 76$.

Sub-order HALCYONES.

Family ALCEDINIDÆ.

Kingfishers.

The habits and outward appearance of the Kingfishers are too well known to require much description. The sub-order consists of a single family, which ranges over the whole world, though only one genus—*Ceryle*—is found in America. The bill is long, stout, and pointed, the wings are moderate, the tail is short and consists of twelve feathers, the legs and feet are weak, the formation of the toes is the same as in the Rollers. Most of the species are fish feeders, but some members, including one Ceylon species, *Halcyon smyrnensis*, may be seen away from water feeding largely on land insects, small lizards, &c. The nest, like that of the Bee-eater, is a small round chamber at the end of a tunnel excavated in a bank, generally near water. As a rule, the round, white, glossy eggs are laid on the bare floor, but in some cases on a lining of fish bones. Seven species, belonging to five genera, are found in the Island, but only four are common, two being excessively rare, while a third is by no means abundant.

Rough Key to Ceylon Halcyones.

A.—Plumage black and white ; length 11·7.

Ceryle varia (Indian Pied Kingfisher).

B.—Cap transversely barred black and blue. Genus *Alcedo*.

(a) Cap light blue and black ; a rufous patch from eye to ear coverts ; length 6·5.

Alcedo ispida (The Common Kingfisher).

(b) Cap deep blue and black ; no rufous patch from eye to ear coverts ; length 6·5.

Alcedo beavani (Beavan's Kingfisher).

C.—Cap orange-red, washed with violet ; only three toes ; length 5·35.

Ceyx tridactyla (Indian Three-toed Kingfisher).

D.—Cap and face dingy brown ; length 15.

Pelargopsis gural (Stork-billed Kingfisher).

E.—Head and face chocolate-brown : no white collar , length 11.

Halcyon smyrnensis (White-breasted Kingfisher).

F.—Crown and cheeks black ; a white collar ; length 12

H. pileata (Black-capped Kingfisher).

CERYLE VARIA (Blanford, Vol III., p. 119).

CERYLE RUDIS (Legge, p. 288).

The Indian Pied Kingfisher.

Description.—Male : Crown and nape black, streaked with white ; rest of upper plumage, including wing coverts and wings, black, mottled or barred with white ; tail feathers white on the base and tip, remaining portion black ; cheeks, wing lining, and most of lower plumage white. The fore-neck is often spotted with black, and there are two black bands across the breast, the upper being the broader, while the flanks are more or less spotted with black.

Females lack the lower black gorget, while the upper broad band is imperfect, leaving the centre of the breast white.

Bill black ; iris brown ; legs and feet blackish.

Length 11·7 ; wing 5·4 ; tail 3 ; tarsus ·4 ; bill from gape 2·75.

Distribution.—Fairly common on lagoons, tanks, near the sea coast, and the lower reaches of our rivers. It is found on some of the larger inland tanks, but its occurrence elsewhere in the Island is rare. It is common throughout the plains of India and Burma, and ranges eastward to China.

Habits, &c.—This species avoids forest streams, and is most plentiful on brackish lagoons and large sheets of fresh water. Unlike many other Kingfishers, it hovers over the water and plunges perpendicularly on its prey, instead of darting at an angle from a fixed perch. The breeding season is about May. The nest hole is driven for some distance into the bank of a river, tank bund, or water channel. The eggs, generally four in number, are of the usual spherical form and glossy white colour. Average size 1·15 by ·92.

ALCEDO ISPIDA (Blanford, Vol. III., p. 122).

ALCEDO BENGALENSIS (Legge, p. 292).

The Common Kingfisher.

Description.—General colour above greenish-blue ; crown and nape with fine transverse bands of dusky black ; a rust-coloured stripe runs from the base of the upper mandible to the ear coverts, terminating in a whitish patch on the side of the neck ; a broad blue stripe runs from the lower mandible down each cheek ; centre of back, rump, and upper tail coverts bright cobalt blue ; wing coverts greenish-blue, each of the feathers of the lesser and median coverts with a brighter blue spot. Wing quills brown, with greenish-blue outer edges ; tail blue above, dusky brown beneath. Chin and throat whitish ; rest of lower surface rusty orange-brown.

Bill, upper mandible black, lower mandible generally reddish-yellow ; iris deep brown ; legs and feet coral red.

Length 6·5 ; wing 2·75 ; tail 1·3 ; tarsus ·35 ; bill from gape 1·8.

Distribution.—Common all over the Island wherever there is water, stagnant or running. The range of the species extends throughout Europe and Asia. In India it is found everywhere, except in the Himalayas.

Habits, &c.—This little Kingfisher lives mainly, if not entirely, on small fish, and is seldom seen away from water. It generally darts on its prey from a fixed perch, but occasionally hovers. The flight is swift and low; the cry is a shrill whistling note. The birds are usually met with in pairs. The breeding season lasts from February till about June, and occasionally birds breed as late as November.

The nest hole is usually in a bank close to the water's edge. The passage is about 2 to 4 feet in length, and the nest chamber 6 inches in diameter. The eggs are of the usual type, and measure about $\cdot 8$ by $\cdot 68$.

ALCEDO BEAVANI (Blanford, Vol. III., p. 124 ;
not in Legge).

Beavan's Kingfisher.

Description.—The colouring is deeper and richer than in the preceding species. Crown, nape, and hind-neck black with narrow cross bands of royal blue; lores rufous, the lower border black; sides of head and cheeks royal blue; a whitish patch on the side of the neck behind the ear coverts; middle of back and rump deep cobalt blue; upper tail coverts deeper, almost royal blue; scapulars, wing coverts, and wings blackish-brown, the inner quills washed with royal blue, and most of the wing coverts tipped with a spot of deep cobalt blue; tail feathers dusky brown at the base, deep purplish-blue at the tip. Chin and throat buffy white; remainder of lower plumage deep chestnut.

Ceylon specimens appear to be darker than typical *A. beavani*.

Bill dusky brown; lower mandible paler; iris dark brown; legs and feet red.

Length 6.5; wing 2.75 tail 1.35; tarsus .35; bill from gape 1.8.

Distribution.—A fairly recent addition, first discovered by A. P. Greene, I believe near Dambulla, in 1893. A. L. Butler found it several times near Medagama, in Uva. It should be looked for on forest streams among the lower hills. It is occasionally seen in Travancore and a few other localities in

South and Central India ; commoner, but locally distributed, at the foot of the Eastern Himalayas, and through parts of Burma to the Andamans, Cochin-China, and Celebes.

Habits, &c.—A shy bird, keeping to lonely streams and tanks in the heart of the jungle. It probably breeds in the Island. The nesting habits are similar to those of the last species. The eggs, four to six in number, average about $\cdot 78$ by $\cdot 69$.

CEYX TRIDACTYLA (Blanford, Vol. III., p. 127 ;
Legge, p. 303).

Indian Three-toed Kingfisher.

Description.—A V-shaped mark of black washed with purple on the forehead at the base of the upper mandible ; crown, nape, hind-neck, lower back, rump, and upper tail coverts orange-red with a metallic lilac gloss, which is strongest behind the eye and on the rump and tail coverts ; upper back black washed with brilliant cobalt blue ; wings dark brown, the coverts tinged with blue ; the edge of the wing, the wing lining, and the inner margin of wing quills rufous ; tail orange-red. There is a black spot in front of the eye and a deep blue spot behind the ear coverts ; lores, cheeks, ear coverts, and lower parts from the fore-neck orange-yellow ; chin and throat white tinged with yellow.

Bill, legs, and feet coral red ; iris brown.

Length $5\cdot35$; wing $2\cdot2$; tail $\cdot9$; tarsus $\cdot35$; bill from gape $1\cdot5$.

Distribution.—Occurs sparingly in the dry and medium zones up to about 2,000 feet. It is found rarely in scattered localities in the Indian Peninsula, also in Lower Bengal and through Burma to Malaya and the Andamans.

Habits, &c.—This beautiful little species is occasionally met with on lonely streams. It is generally seen singly or in pairs, and at times wanders away from water. It has been found breeding in the Mannar District. The nest hole was excavated in the side of a small water-course. The eggs, three in number, were more oval than is the case with most Kingfishers, measuring $\cdot77$ by $\cdot66$.

PELARGOPSIS GURIAL (Blanford, Vol. III., p. 129 ;
Legge, p. 295).

The Brown-headed Stork-billed Kingfisher.

Description.—Head, face, hind-neck, and ear coverts dull brown ; a collar round the back of the neck, together with the whole of the lower plumage, orange-buff, deepest on the flanks and abdomen, and palest on the chin and throat ; upper back and scapulars with the lesser wing coverts dull bluish-green ; the greater wing coverts, the tertiaries, the outer webs and tips of the secondaries, the larger tail coverts, and tail slightly bluer ; the primary quills, the inner webs of the secondaries, and the under surface of the tail dull brown ; the lower back, rump, and lesser tail coverts bright turquoise blue.

In the young birds the buff feathers on the collar and breast have darker edges.

Bill dark blood red ; iris brown ; legs and feet coral red.

Length about 15 ; wing 5·75–6·25 ; tail about 4 ; tarsus ·75 ; bill from gape 3·75.

Distribution.—Occurs more or less all over Ceylon on rivers, streams, brackish lagoons, and tanks. Commonest in the northern half of the Island. It is found throughout the Indian Empire, and extends southward and eastward to Malaya and Cochin-China. Some authorities differentiate the Burmese race as a sub-species, *P. burmanicus*.

Habits, &c.—Our largest Kingfisher. It is always found near water, generally in the neighbourhood of large trees, or, on lagoons, among the mangrove swamps. The cry is a loud, harsh laugh. It feeds on frogs, fish, and crabs. The flight is straight and powerful. The usual nest hole is made in the sandy banks of rivers and streams, generally in dense jungle, or in the bund of a lonely tank. It appears to be always made in a bank well covered with bushes, at least in the immediate vicinity of the nest. The eggs are typical Kingfisher's eggs in shape and texture, and measure about 1·50 by 1·18.

HALCYON SMYRNEENSIS (Blanford, Vol. III., p. 13

Legge, p. 298).

The White-breasted Kingfisher.

Description.—The head, cheeks, hind-neck, sides of neck, flanks, and lower parts from the breast downwards chocolate-brown ; the chin and throat to the centre of the breast white ; back, scapulars, tertiaries, outer portion of secondaries, greater wing coverts, rump, and tail blue, brightest on the rump and tail coverts ; medium wing coverts black, lesser wing coverts chestnut ; inner margin of secondaries and the end half of primaries black ; basal portion of primaries white on the inner and blue on the outer web.

Bill dark blood red ; iris brown ; legs coral red.

Length 11 ; wing 4·5 ; tail 3·3 ; tarsus ·5 ; bill from gape 2·6.

Distribution.—Common all over the Island, and found throughout India and Burma, except on the Himalayas. The range extends from Cyprus to Southern China.

Habits, &c.—May be seen on rivers, swamps, and paddy fields. It is by no means confined to the neighbourhood of water, and is not uncommon in Colombo gardens. It occasionally fishes, but feeds chiefly on insects, small lizards, and crabs. The call is a harsh scream, generally uttered while flying. As the breeding season extends from January to August, there are probably several broods during the year. The nest is the usual hole in the bank of a stream, pond, or ditch. The eggs are of the usual type, and average 1·14 by 1·04.

HALCYON PILEATA (Blanford, Vol. III., p. 133 ;

Legge, p. 301).

The Black-capped Kingfisher.

Description.—Crown, nape, and cheeks black ; a white collar round the neck ; the feathers of the upper back adjoining the collar and the wing coverts are black ; the general hue of the rest of the upper plumage, including the tail, tertiaries, and the outer webs of the secondaries, is purplish-blue, brightest on the lower back and rump. The inner webs and the tips of

the secondaries are black ; the primaries are black on the terminal half, the basal portion being white on the inner and bluish-white on the outer web. Chin, throat, and middle of breast white, shading into rusty buff on the remainder of the lower parts ; under surface of tail black.

In young birds the breast feathers have dusky black fringes.

Bill deep coral red ; iris dark brown ; legs and feet dull red.

Length 12 ; wing 5·1 ; tail 3·25 ; tarsus ·6 ; bill from gape 3·0.

Distribution.—Solitary specimens have been obtained in the Northern, Eastern, and Western Provinces. This species has been found in various localities throughout the Indian Peninsula, the Ganges delta, Assam, and Burma, and ranges eastwards through Malaya to China and Corea. It is extremely rare over most of its habitat, but turns up unexpectedly all over India, generally near the coast, but at times far inland. It is common during the breeding season in Hong Kong.

Habits, &c.—Occasionally seen by fresh water, but generally found on brackish lagoons and among mangrove swamps, where it feeds upon the crabs, which swarm in the mud. It may possibly be found breeding in Ceylon, as the nest has been taken in Travancore in February and March. The nest is the usual hole, generally in the sandy banks of streams near the seashore, but occasionally on the banks of forest streams.

The eggs are of the usual round shape and glossy texture, four to six in number, and measure about 1·15 by 1.

Sub-order BUCEROTES.

Family BUCEROTIDÆ.

Hornbills.

The Hornbills are a family of large, ungainly, forest birds, which are found in Africa, Tropical Asia, and New Guinea. They derive their English name from the enormous bill, which, as a rule, is surmounted by a hollow or cellular horny casque. In some cases, however, including that of the smaller of the two species found in Ceylon, the casque is wanting. Other peculiar features are that the eyelids are furnished with strong lashes, while the wing lining—i.e., the coverts on the

underside of the wing—does not cover the bases of the quills. The feet are fairly large and stout, and formed like those of the Rollers. The nidification is extraordinary, and the accounts of it were long regarded as travellers' fairy tales. At the breeding season, before the eggs are laid, the female is walled up in the hollow of a tree by means of a plaster formed of earth mixed with the bird's droppings, or of the droppings alone. An opening is left, through which the male feeds her, and there she remains imprisoned, apparently until the young are fledged. The eggs when new laid are white, but, as may be imagined, they soon get discoloured as incubation proceeds. The young are naked when hatched. Hornbills feed largely on fruit, but also to some extent on small lizards, scorpions, insects, &c. They are frequently, but erroneously, called "Toucans," a name which applies to a family of large-billed birds of brilliant plumage, akin to the Barbets, and found only in South America.

Rough Key to Ceylon Bucerotidæ.

A.—Size large ; length about 36 ; a compressed casque pointed in front.

Anthracoceros coronatus (Malabar Pied Hornbill).

B.—Size smaller ; length about 23 ; no casque.

Lophoceros gingalensis (Ceylon Hornbill).

ANTHRACOCEROS CORONATUS (Blanford, Vol. III., p. 144 ;
Legge, p. 272).

The Malabar Pied Hornbill.

Description.—The head, neck, and upper parts with the wing and the middle pair of tail feathers are glossy greenish-black ; the remainder of the tail and the under parts from the breast downwards white. The primaries—with the exception of the first two quills, which are small—and the secondaries have broad white tips, and the primaries have whitish bases.

The bill is large and curved, with serrated edges ; in adults it is surmounted by a large horny casque, which slopes backward over the crown, and in front runs into a pointed projection overhanging its line of junction with the bill. The

casque and bill are pale yellow, with a black patch at the base of the mandible and a large black patch covering most of the upper portion of the casque. In males the back of the casque is also black. Iris in males orange-red, in females brown; naked skin round eye, blackish in males, whitish in females; bare skin of throat flesh coloured; legs and feet grayish.

In young birds the contour of the casque is not developed, but grades into the upper mandible, giving the beak a distinctly Roman-nosed appearance, and there are patches of bare skin on the thighs and hind-neck, which remain unfledged until after the wing and tail quills are fully formed.

Length about 36; wing 13; tail 13; tarsus 2.5; bill from gape 7. Females are slightly smaller.

Distribution.—Found in the drier forest zone of the low-country, ascending the foothills to about 2,500 feet; commonest in the northern half of the Island. In India it occurs at the foot of the Western Ghats and the forests of South-west Bengal, Orissa, and the Eastern-Central Provinces.

Habits, &c.—Generally found in small troops in heavy forest. It has a laboured, ungainly, dipping flight, alternately flapping its wings and sailing. The note is loud and harsh. The curious nesting habits are described in the remarks on the family. The breeding season appears to be from March to June. The eggs are two to four in number, white at first, but much discoloured as incubation proceeds. They measure about 2 by 1.5.

LOPHOCEROS GINGALENSIS (Blanford, Vol. III., p. 157).

TOCKUS GINGALENSIS (Legge, p. 275).

The Ceylon Hornbill.

Description.—Crown and nape ashy-brown with pale shaft-stripes; ear coverts slightly darker; rest of upper plumage ashy-gray, the wing coverts with darker edges; wing quills black, the middle primaries with white tips and the secondaries with gray outer margins; tail feathers dusky with a greenish tinge, all but the central pair with broad white ends; in old birds the three outer pairs become entirely white. Lower parts grayish-white, becoming lighter with age; vent and lower tail coverts dingy rufous.

Bill curved, and not surmounted with a casque; in adult males it is yellowish-white, with a black patch at the base of the upper mandible from the gape to the nostril, and another indistinct patch beneath the lower mandible. Females have the bill grayish-black, with a long white patch on the lower portion of the upper mandible. Iris red; orbital skin and eyelashes black; legs and feet greenish lead colour.

Length 23; wing 8; tail 9; tarsus 1·7; bill from gape 4·25. Females slightly smaller, and with shorter bills.

Distribution.—Peculiar to Ceylon; fairly common all over the low-country wherever there is forest. It ascends the hills to about 4,000 feet.

Habits.—A rather shy forest bird, keeping to the tops of trees. The flight is slow and dipping. The cry is rather a harsh laugh, starting with the syllable “kaa,” which is often repeated, at first slowly, then quicker and quicker. It breeds from April to August in the fashion peculiar to the family. The two or three dingy white eggs measure about 1·62 by 1·25.

Sub-order UPUPÆ.

Family UPUPIDÆ.

Genus **Upupa**.

Hoopoes.

The Hoopoes are confined to a single family and genus, which ranges through the temperate and tropical parts of the Old World. In structure and nesting habits, though not in appearance, they are closely related to the Hornbills. They are all birds of moderate size, about one foot in length. The bill is long and slender, and curves from the base. There is a large conspicuous crest on the crown, folded or erected at will. The wings are rounded, the tail moderate in length, and the legs short. Hoopoes feed on the ground, scratching and probing for grubs and insects. The females, though not walled into nest holes like the Hornbills, sit very close, and are fed entirely by the males during the breeding period. Only one species occurs in Ceylon.

UPUPA INDICA (Blanford, Vol. III., p. 161).

UPUPA NIGRIPENNIS (Legge, p. 278).

The Indian Hoopoe.

Description.—Head, crest, hind-neck, throat, upper back, and breast cinnamon brown. The crest feathers are broadly tipped with black, and the breast has a vinaceous tinge. The lower back, wings, and tail are black barred with white, the tertiaries are tinged with brown and barred and tipped with buff. The abdomen is whitish, more or less streaked with brown, the vents and under tail coverts are white, the thighs have often a rufous tinge.

Bill brown-black, pinkish at the base; iris brown; legs and feet lead colour.

Length 11·5; wing 5·25; tail 3·75; tarsus ·85; bill from gape 2·3.

Distribution.—Fairly common in the Northern Province, occasionally wandering as far south as Anuradhapura and Chilaw; occurs in portions of the park country in the Eastern Province and on the Uva patanas, while it is by no means rare in the Hambantota District eastwards of Ranna. It is found all over India, except in Sind and the Western Punjab, and ranges through Burma to Siam, Indo-China, and Southern China.

Habits, &c.—This species is found chiefly in open country, grazing grounds, and patanas, and is generally seen on the ground searching for insects. The breeding season appears to last from November to April. The birds nest in holes in trees, banks, or walls. The nest chamber is usually very insanitary. The eggs, four to seven in number, are of a pale bluish- or greenish-white, and measure about ·97 by ·66.

Order **MACROCHIRES.**

Swifts, Nightjars, and Frogmouths.

By Blanford the Swifts, Nightjars, and Frogmouths are grouped together in the above order, which also includes the Humming Birds, *Trochilidæ*, and the Oil Birds, *Steatornithidæ*, two families, which are confined to the New World. All the members of the order have short bills with broad gapes, and live on insects captured while on the wing.

There are three Indian sub-orders: *Cypseli*, Swifts; *Caprimulgi*, Nightjars; and *Podargi*, Frogmouths. Each sub-order consists of a single family.

Sub-order CYPSELI.

Family CYPSELIDÆ.

Swifts.

Outwardly Swifts resemble Swallows, in each case the form having been specialized for the purpose of a swift and enduring flight. Anatomically there are considerable differences. In the structure of the sternum, feet, and wings, the Swifts are Picarian, while the Swallows are typically Passerine. All Swifts have ten tail feathers, Swallows have twelve. The primary wing quills are very long and curved, the secondaries extremely short. The bill is small and hooked at the tip, while the gape is broad. The hind toe is either directed forwards or is more or less reversible. Swifts are aerial in their habits, and feed entirely upon insects captured on the wing. They are found all over the world, except in Arctic or Antarctic regions. Their powers of flight are enormous, and they often cover immense distances in the course of a day's wanderings. All our species are resident or mainly so. The nidification varies, but all species lay white eggs, and in almost all cases the materials of the nest are cemented together with hardened saliva, which is also used to glue the nest itself to the surface from which it depends.

The family is divided into three sub-families:—

(1) *Cypselinæ*.—The true Swifts, in which the tarsus is feathered, and all the front toes have but three phalanges or joints.

(2) *Chæturinæ*.—Spinetails, &c., have the normal number of phalanges in the three front toes, i.e., three in the second toe, four in the third, and five in the fourth. In most forms, including both our Ceylon species, the tarsus is naked.

(3) *Macropteryginæ*.—Crested Swifts differ from the two preceding sub-families, in that the closed wings only just reach the end of the tail instead of extending far beyond it, while the head is crested.

Sub-family *Cypselinæ*.*True Swifts.*

The typical Swifts are represented in Ceylon by three species belonging to two genera.

Rough Key to Species.

A.—All four toes directed forwards. Genus *Cypselus*.

(1) Size large ; wing 8·25 ; tail deeply forked.

C. melba (Alpine Swift).

(2) Size smaller ; wing 5·20 ; a white band across rump ; tail almost square.

C. affinis (Common Indian Swift).

B.—Toes arranged in pairs ; first and second toe pointing inwards, third and fourth outwards ; size small ; wing 4·4 ; tail deeply forked ; no white on rump.

Tachornis batassiensis (Palm Swift).

CYPSELUS MELBA (Blanford, Vol. III., p. 164 ;

Legge, p. 317).

The Alpine Swift.

Description.—Upper parts with the sides of the head and neck mouse-brown ; darker on the wings and tail ; chin, throat, breast, and abdomen white ; a broad, dark brown band across the upper breast ; wing lining and lower tail coverts deep brown with whitish edges. In young birds all the dark feathers have whitish edges.

Bill black ; iris brown ; legs and feet livid brown.

Length 8·5 ; wing 8·25 ; tail about 3 ; tarsus ·55 ; bill from gape ·85.

Distribution.—Resident in the higher hills, and being a bird of great powers of flight, it visits all parts of the Island. The species ranges from the Alps, Southern Europe, and Northern Africa, eastwards to India.

Habits, &c.—The birds roost and breed in colonies on high rocky cliffs, and cover enormous distances during the day while hawking for insects. The cry is shrill and tremulous.

They probably breed during April and May on some of the great precipices of the higher ranges in the Central Province and Uva. The nests are of the usual Swift type, and are composed of feathers, grass, &c., cemented with hardened saliva and glued to the surface of a rock. The eggs, three or four in number, are pure white, smooth, and slightly glossy. In shape they are elongated ovals, and average about 1·2 by ·75.

CYPSELUS AFFINIS (Blanford, Vol. III., p. 168 ;
Legge, p. 319).

The Common Indian Swift.

Description.—Head, wings, and tail dark brown with a slight gloss, the crown and nape slightly paler ; back black with a greenish gloss ; a broad whitish band across the rump and sides, chin and throat whitish with faint black shaft-stripes ; remainder of under surface blackish-brown, paler on the wing lining and lower tail coverts.

Bill black ; iris deep brown ; legs and feet vinous-brown.

Length about 5·3 ; wing about 5·20 ; tail 1·75 ; tarsus ·4 ; bill from gape ·75.

Distribution.—Occurs over the greater part of the Island ; found throughout India, and ranges westward to Palestine and the greater part of Africa.

Habits, &c.—While there are regular breeding colonies in many parts of the low-country, as at Trincomalee, Anuradhapura, Dambulla, and Kirinde, in other parts this species appears to be a mere wanderer. It is, however, resident almost throughout the hills. It generally occurs in fairly large flocks, which may be seen high in the air hawking for insects. The cry is a shrill, weak scream. The breeding season is between March and July. The birds nest in colonies in rock caves, verandahs of buildings, &c. The nests are made of grass, straw, or feathers, cemented together with saliva, and glued to the roof or walls of the nesting haunt. The eggs, generally two in number, are long, pure white ovals, measuring about ·92 by ·59.

TACHORNIS BATASSIENSIS (Blanford, Vol. III., p. 170).

CYPSELUS BATASSIENSIS (Legge, p. 322).

The Palm Swift.

Description.—Upper parts ashy-brown, the head slightly darker, the wings and tail dark brown with a slight gloss; under parts mouse-gray, paler on the throat and chin.

Bill black; iris reddish-brown; legs and feet vinous-brown.

Length 5·20; wing 4·4; tail 2·6; tarsus ·4; bill from gape ·5.

Distribution.—Common all over the low-country and in the lower hills: most abundant in districts where the palmyra palm grows. Found in suitable localities throughout the Indian Peninsula.

Habits, &c.—This little Swift prefers fields and open spaces round palmyra and coconut plantations, or, in the south of the Island, near areca palms. It never wanders far from the palms in which it roosts and nests. The breeding season appears to extend from October to April. The nest is placed on the under surface of a downward hanging palm leaf, and is a little open pocket made of wild cotton and feathers glued together with saliva. Two or three eggs are usually laid. They are pure white long ovals, measuring about ·71 by ·46.

Sub-family *Chæturinæ*.

Spinetails, &c.

This sub-family contains two Indian genera, each of which is represented in Ceylon by a single species. The Spinetails—genus *Chætura*—are the fastest birds in existence. They take their name from the tail feathers, in which the shafts project beyond the webs and end in a spiny point. The genus *Collocalia* comprises the Swiftlets, whose nests, almost wholly composed of hardened saliva resembling isinglass, are much prized by the Chinese as an article of food.

Rough Key to Species of Chæturinæ.

A.—Size large ; wing 8 ; tail nearly square ; shafts of tail feathers ending in spines.

Chætura indica (Brown-necked Spinetail).

B.—Size small ; wing 4·6 ; tarsi naked ; tail slightly forked ; tail feathers normal ; hind toe directed backwards, and only partially reversible.

Collocalia unicolor (Indian Edible-nest Swiftlet).

CHÆTURA INDICA (Blanford, Vol. III., p. 173).

CHÆTURA GIGANTEA (Legge, p. 314).

The Brown-necked Spinetail.

Description.—The crown, the sides of the head, the nape, wings, the sides of the rump, upper tail coverts, and tail black, with a metallic gloss of green and steel blue ; the back, scapulars, and rump pale brown, palest on the centre of the back. A deep velvet black spot in front of each eye, and a white spot on each side of the forehead bordering the upper mandible ; chin and centre of throat whitish ; lower parts umber-brown with a faint gloss ; under tail coverts and a streak along the flank white.

Bill black ; iris dark brown ; legs and feet fleshy purple.

Length 9 ; wing 8 ; tail 2·7 ; tarsus ·65 ; bill from gape 1.

Distribution.—Resident in the hills, occasionally wandering over the whole Island. It occurs in Southern India, and also ranges from Assam eastwards throughout Burma.

Habits, &c.—This species may be seen wheeling at enormous speed round hillsides. Often after rain it wanders far over the low-country in the course of a day's flight. The nesting habits are peculiar. It has been found breeding in March and April on the Travancore hills inside green trees, of which the core is hollow down to the ground. The nest is a mere depression in the earth at the foot of the hollow core, and is lined with dry leaves and straw. The eggs, three to five in number, are pure white, and measure about 1·28 by 1. The shell is hard, and like porcelain in texture.

COLLOCALIA UNICOLOR (Blanford, Vol. IV., p. 485).

COLLOCALIA FUCIPHAGA (Blanford, Vol. III., p. 176).

COLLOCALIA FRANCICA (Legge, p. 324).

The Indian Edible-nest Swiftlet.

Description.—Upper parts blackish-brown, with a greenish gloss on back, wings, and tail; under parts mouse-gray, the feathers of the lower breast and abdomen with darker shaft-stripes; tarsi quite naked.

Bill black; iris brown; legs and feet fleshy brown.

Length 4·65; wing 4·6; tail 2·1; tarsus ·4; bill from gape ·4.

Distribution.—Roosts and breeds in rock caves in the hill ranges, and also in the isolated hills of the low-country, as at Hiniduma and Ritigala. As it wanders a good deal in the course of a day's flight, it may be seen almost anywhere in the Island. It also occurs in the South Indian hills and the Western Himalayas.

Habits, &c.—This species is often seen in company with the Palm Swift hawking for insects over open ground, round tanks, &c. The breeding season varies in different localities between Christmas and April. The birds nest in large colonies. Of late years they have taken very kindly to the railway tunnels between Ohiya and Bandarawela. The nest is a half saucer formed of clear hardened saliva mixed with a little moss and glued to the wall of the cave. Two white eggs of the usual type are laid, measuring about ·84 by ·53.

Sub-family *Macropteryginae*.

Crested Swifts.

This sub-family consists of a single genus confined to India, Malaya, and the New Guinea region. Only one species occurs in Ceylon.

The Crested Swifts differ considerably from the other sub-families. The tarsus is short and naked, and the closed wings do not extend beyond the tail, which is long and forked.

The plumage is more silky than in other Swifts, and differs slightly in the two sexes. The feathers of the crown are elongated into a crest, which is raised or depressed at will.

MACROPTERYX CORONATA (Blanford, Vol. III., p. 180).

DENDRO CHELIDON CORONATA (Legge, p. 328).

The Indian Crested Swift.

Description.—Male : Upper plumage with the sides of the neck bluish-gray ; the crest and upper wing coverts darker with a bluish-green gloss ; wing and tail quills dark brown glossed with green ; lores velvet black, bordered above with a thin whitish stripe ; upper chin, moustache stripe, and ear coverts chestnut ; throat, breast, and sides of body light bluish-gray, passing gradually into the white of the abdomen and lower tail coverts.

Females lack the chestnut patch on the face and throat ; the ear coverts are almost black, and are bordered below by a white stripe from the gape.

Young birds have broad brownish-gray borders, edged with white, on the feathers of the upper parts, and dark brown bars near the tips of the feathers on the lower plumage.

Bill black ; iris dark brown ; legs pinkish-brown.

Length 9·5 ; wing 6·1 ; tail, outer feathers about 5, central about 1·75 ; tarsus ·4 ; bill from gape ·75.

Distribution.—Fairly common all over the Island. Like most Swifts, the birds wander a good deal ; in the northern half of the Island it is found chiefly round the large tanks. It occurs in the better wooded parts of India, and extends eastwards throughout Burma and Siam.

Habits, &c.—Found generally in small parties round forest clearings or jungle tanks. It is extremely fond of perching on dead trees. When flying over water, it often dips to the surface and rises again. The breeding season is about May. The nest is a tiny, fragile, half saucer composed of flakes of bark cemented with saliva, and glued to the side of a bare horizontal branch generally at some height from the ground. A solitary grayish-white egg is laid, measuring about ·85 by ·55.

Sub-order CAPRIMULGI.

Family CAPRIMULGIDÆ.

Genus **Caprimulgus**.*Nightjars.*

The Nightjars or Goatsuckers are a family with crepuscular and nocturnal habits, found almost all round the world, except in the Frigid Zones. The plumage is soft and mottled, and the flight noiseless. Their food consists wholly of insects, which are generally caught on the wing. The gape of the mouth is very wide, but the bill itself is short, weak, and flexible. The only genus found in Ceylon is furnished with strong rictal bristles, *i.e.*, bristles bordering the upper mandible of the bill. The wings are long and pointed. The legs are rather weak; the middle toe is long, and furnished on the inside of the claw with a comb-like appendage. There is no nest, the two protectively coloured eggs being laid on the bare ground. The young when hatched are covered with down, and are helpless. In one Ceylon species—*C. asiaticus*—the sexes are alike, but generally males are distinguished by white spots on the wings and tail. In the females these spots are either buff coloured or rufous, or are altogether wanting. Three species are found in the Island.

Rough Key to Ceylon Caprimulgi.

A.—Tarsus almost entirely naked; sexes alike; length 9.

C. asiaticus (Common Indian Nightjar).

B.—Tarsus feathered; sexes not quite alike; length 10 or over.

(1) Rictal bristles white at the base, a continuous white patch across the throat.

C. macrurus (Horsfield's Nightjar).

(2) Rictal bristles dark throughout; centre line of throat dark, dividing the white throat patch into two.

C. indicus (Jungle Nightjar).

CAPRIMULGUS ASIATICUS (Blanford, Vol. III., p. 186 ;
Legge, p. 343).

The Common Indian Nightjar.

Description.—General colour of upper plumage sandy gray finely pencilled with brown ; forehead and centre of crown striped with black ; the feathers of the back with dark shaft-stripes ; round the neck a broad collar of buff speckled with black ; scapulars velvety black with broad margins of rich buff ; paler buff patches on the wing coverts. Wing quills dark brown, the first four primaries each with a large white spot in the middle, the secondaries barred with rufous-buff ; middle tail feathers coloured like the back, but with indistinct narrow cross bars, the two outer pairs with large white tips, and the outermost pair with buff margins to the outer web. Moustache stripe whitish-buff : on each side of the throat a patch of white feathers tipped with buff and black ; rest of lower parts buff barred indistinctly with brown ; lower tail coverts buff without any bars. Sexes alike.

Bill reddish, the tip black ; iris deep brown ; legs and feet fleshy brown.

Length 9 ; wing 5·75 ; tail 4 ; tarsus ·8 ; bill from gape 1·2. Females rather smaller.

Distribution.—Common all over the low-country, except in the wet forest zone, and ascends to about 4,000 feet in the drier parts of the hills. It occurs throughout the greater part of India and Burma, except on the higher hills and in the large forests.

Habits, &c.—This species haunts scrub jungle, especially low sandy scrub near the sea ; it is also fond of open tracts near woods and chenass. Any one motoring after dark in the wilder parts of the Island will probably flush dozens of them off the road. During the day they roost on the bare ground, between bushes, and can almost be trodden on before they get up. The cry starts off with a slow *chuk*, which is repeated at quickening intervals, and exactly resemble the sound of a stone skimming across a stretch of ice. The breeding season is about April, and again in August. The two eggs are laid on the bare ground, generally in the shelter of a bush

They are fairly regular ovals, with a smooth texture, and a ground colour of salmon pink, or some approximate shade, marbled and mottled with brownish-red and faint purplish-gray. Average size 1·05 by ·78.

CAPRIMULGUS MACRURUS (Blanford, Vol. III., p. 188).

CAPRIMULGUS ATRIPENNIS (Logge, p. 340).

Horsfield's Nightjar.

Description.—Male: General colour above a minutely mottled brownish-buff; crown and hind-neck paler, with long black spots on the middle feathers; lower hind-neck slightly tinged with rufous; scapulars with large velvety black patches, some feathers with buff bars and margins; wing coverts mottled and stippled with black and buff; a white spot on the inner web of the first primary and on each web of second primary, a white bar across the third and fourth.

Tail feathers blackish-brown with lighter mottlings, the two outermost pairs with broad white tips. Moustache stripe whitish; chin, throat, and breast a finely mottled brown; across the centre of the throat a patch of white feathers tipped with buff and black; abdomen and lower tail coverts fulvous, narrowly barred with dark brown.

In females the spots on the primaries and tail feathers are smaller and buff coloured instead of white.

Bill reddish-brown, tip black; iris deep brown; legs brown.

Length 10·5–11; wing 7; tail 5; tarsus ·7; bill from gape 1·35. Females are smaller. Wing about 6·5.

Distribution.—More local than the preceding species, but fairly well distributed over the low-country and up to about 3,500 feet. Blanford has united in one species three races: *C. atripennis*, a small form from Southern India and Ceylon; *C. macrurus*, which ranges through the Malay Peninsula to Australia; and *C. albonotatus*, which occurs in Northern India and Burma.

Habits, &c.—More of a forest bird than *C. asiaticus*, but equally fond of squatting on paths after dark. It also frequently perches on dead branches of trees. It is found mainly in dry forest or chena, avoiding localities in which there

are no large trees. The note is a fairly loud "churr," preceded by a low "grog-grog-grog" heard only when one is close to the bird. The breeding season is from March to about May. Two eggs, as usual, are laid on the bare ground, but Ceylon eggs are not of the normal marbled type. Eight eggs in my collection taken from five nests are pale buff sparingly spotted with dark brown. Legge and A. L. Butler both give the same description. Northern Indian birds appear to lay eggs of the usual marbled type, so probably the southern race is a good sub-species or even species. Average size of Ceylon eggs 1.14 by .88.

CAPRIMULGUS INDICUS (Blanford, Vol. III., p. 190).

CAPRIMULGUS KELAARTI (Legge, p. 337).

The Jungle Nightjar.

Description.—Male : General colour above ash-gray mottled with white, and finely pencilled with dark brown ; the centre of the crown and nape, the back, scapulars, rump, and upper tail coverts are heavily marked with black ; the scapulars have pale buff margins ; wing coverts dusky brown with ocellate whitish spots, which are faintly mottled with brown. Wing quills dusky brown ; first primary notched on the outer web with buff and with a white spot on the inner web ; the next three primaries have a white bar right across the quill. The tail is much mottled, and is irregularly barred with black. All feathers, except the central pair, have large white spots towards the end, the extreme tips being mottled brown. There is an imperfect white moustache stripe ; centre of the throat chestnut buff with black cross markings, on each side of the throat the feathers have white bases, which form a white patch ; the buff markings are continued round the sides of the neck forming an imperfect collar ; fore-neck and breast dusky brown mottled with ash colour ; abdomen and lower tail coverts whitish-buff with brown bars.

Females are darker ; the spots on the wing quills are smaller, and buff instead of white ; the tail feathers have no white tips, and the throat patches are buff.

Bill vinous-brown, paler at the gape and black at the tip ; iris deep brown ; legs and feet vinous-brown.

Length 10·5 ; wing 7·25 ; tail 5 ; tarsus ·6 ; bill from gape 1·25. Females slightly smaller.

Distribution.—Occurs mainly on the hills of the central ranges down to about 3,000 feet, but Legge also found it in the forests at the foot of Friar's Hood in the Eastern Province.

Blanford again unites in one species three forms : *C. kelaarti*, from Ceylon and South India ; *C. indicus*, which occurs over the greater part of India and Burma ; and *C. jotaka*, a larger bird which ranges from the Amur and Japan through South-eastern Asia to New Guinea.

Habits, &c.—Occurs chiefly on the patanas, open forest glades, and " eliyas " of the higher hills. During the day it lies up among the rocks at the edge of the jungle, coming out in the evening.

The cry is described by Legge as " chump-pud " repeated at intervals. It is noisiest in the breeding season, which occurs about April.

The usual two eggs are laid on the ground under a bush. The ground colour is salmon-pink, with brown and purplish-gray markings. Average size (in the small South Indian race) 1·15 by ·86.

Sub-order PODARGI.

Family PODARGIDÆ.

Genus **Batrachostomus**.

Frogmouths.

The Frogmouths closely resemble the Nightjars in their general appearance and habits, but are readily distinguished by the bill, which is extremely broad, and flat, rigid, and horny, while the tip is hooked. There are no true rictal bristles, but at the base of the bill on each side is a tuft of bristly feathers. There are similar tufts in front of the eyes, while the feathers of the ear tufts also end in bristles. The wings are rounded and short. The nest is either a structure of twigs, or a pad of moss, &c., placed on a branch. The eggs, one or two in number, are white and glossless. Frogmouths are found in South India, the Eastern Himalayas, South-eastern Asia, and Australasia. One species occurs in Ceylon.

BATRACHOSTOMUS MONILIGER (Blanford, Vol. III., p. 196 ;
Legge, p. 331).

The Ceylonese Frogmouth.

Description.—Male : In a beautiful gray bird from the North-Central Province the general colour of the upper plumage is lichen-gray, mottled with soft black. The feathers of the crown and back end in black spots with a minute tip of white or buff ; an indistinct white collar on the hind-neck ; the outer feathers of the scapulars almost entirely mottled white, with the same terminal black spots and white specks as on the crown feathers, the inner scapulars are pale only on the outer web. Some of the wing coverts have conspicuous white spots. Primary and outer secondary quills dull blackish-brown, notched with black or rufous on the outer web ; tail mottled gray with narrow wavy dark cross bars. Under surface the same mottled gray as the back, with an imperfect white gorget ; the abdomen much paler. Some birds, probably older, are less mottled and much more rufous.

Females are reddish-brown with faint blackish mottlings, and have an indistinct white collar, sometimes wanting, on the hind-neck ; there are minute black tips to a few of the scapulars, and white spots on a few of the longer wing coverts ; the tail feathers bear traces of narrow dark bars.

The feathers of the throat have sub-terminal black bars and white fringes ; a few similar feathers are scattered over the abdomen.

Bill olive-brown, paler on the lower mandible ; iris dull yellow ; legs yellow or fleshy brown.

Dimensions vary considerably ; length 7·75–9 ; wing 4·3–5 ; tail 4–4·75 ; tarsus about 5 ; bill from gape about 1·4.

Distribution.—Occurs in the heart of the jungle probably all over the Island, but very seldom seen. Specimens have been obtained from sea level to nearly 6,000 feet up. It is also found in the Wynaad and Travancore.

Habits, &c.—A sluggish nocturnal bird frequenting thick bamboo jungle or dense forest growths. During the day it lies fast asleep perched across a branch with its bill turned

upwards. A. L. Butler reported it as common round Medagama in Uva, and describes the cry as a rapid "coorroo, coorroo, coorroo." Legge also noticed a chuckling cry as fairly common in the northern forest tract and in Ratnapura, and attributed it to this species, which is more abundant than generally supposed. The nest is a small pad of dead leaves, lichen, &c., woven in with vegetable down, and placed in the fork of a sapling at some height from the ground. The breeding season is probably from Christmas to April. The single egg is pure white and glossless; the texture is fine, but the shell is rather fragile and porous; the shape is long and cylindrical, with little difference between the two ends. Average measurement about 1.19 by .80.

Order **TROGONES.**

Family TROGONIDÆ.

Genus **Harpactes.**

Trogons.

The Trogons form a well-marked group of forest birds found in the tropical regions of Asia and America, and in Africa south of the Sahara. They are noted for their brilliant colours, soft plumage, and tender skin, and may be told apart from all other birds by the structure of their feet. The first and second toes are turned backwards, the third and fourth forwards. Herein they differ from the zygodactylic orders, in which the first and fourth toes are turned backwards. The bill is short, strong, and wide; the tip of the upper mandible is hooked and notched; the nostrils and chin are covered with bristles. In the only Indian genus the wing is short and rounded; the tail is long, with broad feathers, which are square-tipped in adults and pointed in young birds; the tarsi are short and half feathered; the feet are small.

All Indian species feed on insects, captured mainly while flying, but sometimes picked up from the ground. They breed in the hollows of rotten stumps or branches, laying three creamy white eggs on the bare wood. Only one species is found in Ceylon.

HARPACTES FASCIATUS (Blanford, Vol. III., p. 199 ;

Legge, p. 269).

The Malabar Trogon.

Description.—Male : Head, neck, and upper breast dull black, the breast slightly tinged with slate gray ; back, scapulars, and the short wing coverts along the forearm yellowish-brown ; rump and upper tail coverts slightly paler. Wings mainly black ; the unexposed bases of the primary quills are white, and all primaries, except the first, have a well-defined white outer edge ; outer webs of secondary quills, the whole of the tertiaries, and the wing coverts, except those on the forearm, black, daintily barred with fine, close set, wavy white lines. The middle tail feathers are chestnut, tipped with black, in the next two pairs the black increases on the inner web, while the three outer pairs have black bases and long white tips. A white band across the chest divides the dark upper breast from the pale crimson of the rest of the lower plumage.

Females : Head and neck olive-brown ; upper breast lighter brown ; chin blackish ; the bars on the wing coverts and inner wing are light brown instead of white, while the second and third pair of tail feathers have more chestnut. There is no white chest band, and the under parts from the lower chest to the vent are brownish-buff.

Immature males have a brownish head and neck, the bars on the wings are fulvous, the chest feathers are mixed with gray, and the breast and abdomen with rusty buff.

Bill deep blue ; iris dark brown ; legs grayish-blue.

Length 11 ; wing 4·7 ; tail 5·7 ; tarsus ·6 ; bill from gape 1. Females slightly smaller. Indian birds are larger.

Distribution.—Occurs in high forest all over the Island. It is also found on the Malabar Coast and in parts of Central India.

Habits, &c.—May be found in thick forest. The birds generally go about in pairs and spend most of their time perched bolt upright on a large branch, flying out now and again to catch insects. The breeding season is about May. Three very glossy pale buff eggs are laid in a hollow in a rotten stump 6 to 12 feet off the ground. Average size about ·94 by ·82.

Order **COCCYGES.**Family **CUCULIDÆ.**

The Cuckoos, Koels, Malkohas, and Coucals are comprised in one family—*Cuculidæ*—which is united with an African group, the Plantain-eaters—*Musophagidæ*, to form the Order *Coccyges*.

The birds of this order show some affinities in their anatomy with the Parrots and also with the Game birds. The *Cuculidæ* are found almost all over the world, but are most numerous in the tropics. The feet are zygodactylic, the first and fourth toes being directed backwards. The young are hatched naked, and acquire their feathers without passing through a downy stage. The family is divided by Blanford into two sub-families: the *Cuculinæ*, or true Cuckoos, which have the tarsus feathered in front, and the *Phænicophainæ*, in which the tarsus is naked.

Sub-family *Cuculinæ*.*Cuckoos.*

The true Cuckoos are a curious group of birds with parasitic breeding habits. Nearly all the species, instead of pairing, indulge in promiscuous intercourse, while the eggs are placed in the nests of other birds. In most cases the females appear to lay their eggs on the ground, and convey them in their bills to the chosen nest. As soon as the young cuckoos grow large enough, they eject the young of their foster parents from the nest.

Cuckoos are found nearly all over the world; most species are migratory, or partially so. They are wholly or mainly insectivorous. The bill is of moderate size, slightly curved towards the tip, and pointed; the wing is more or less pointed, and the tarsus more or less feathered in front. In most genera the measurement of the tail is equal, or nearly equal to that of the closed wing. In one genus, *Coccystes*, it is much longer. The last-named genus is also differentiated by a pointed crest and rather rounded wings, and forms a connecting link between the typical forms of the present sub-family

and the *Phœnicophainæ*. The various species of the genera *Cuculus* and *Hierococcyx* are very hawk-like in their flight and outward appearance, but may be recognized by their head and bill, which are much longer in profile than those of a bird of prey, and by their zygodactylic feet. The genus *Surniculus* closely mimics the Black Drongo.

Those who care to know more about the breeding habits and eggs of this group will find an interesting series of articles with coloured plates in Volume XVII. of the Journal of the Bombay Natural History Society.*

Ten species, which include representatives of all the seven Indian genera, are found in Ceylon, but several of them are rare migrants, and one is rather a doubtful inclusion in our list.

Rough Key to Ceylon Cuculinæ.

A.—No crest ; tarsus feathered.

I.—Wing over 5·6 ; appearance hawk-like.

(a) Tail not regularly cross-barred ; primary quills twice the length of secondaries. Genus *Cuculus*.

(1) Wing 8 or over ; tail same shade of brown throughout.

C. canorus (The Cuckoo).

(2) Wing about 6.

C. poliocephalus (The Small Cuckoo).

(3) Wing about 7·5 ; a broad black band at end of tail.

C. micropterus (The Indian Cuckoo).

(b) Tail regularly cross-barred ; primary quills half as long again as secondaries.

Hierococcyx varius (The Common Hawk Cuckoo).

* "The Oology of Indian Parasitic Cuckoos" (J. B. N. H. S., Vol. XVII., pp. 72, 351, 678), by E. C. Stuart Baker.

II.—Wing 5 inches or under and comparatively shorter, primaries only one-third longer than secondaries.

(a) Bill fairly slender, not compressed ; wing about 4·5 ; adult plumage unbarred ashy-gray ; immature birds suffused with rufous on throat and chest, and with barred upper plumage.

Cacomantis passerinus (Indian Plaintive Cuckoo).

(b) Bill stouter and compressed ; wing about 5 ; no distinct immature dress ; plumage always barred ; no rufous on throat and chest.

Penthoceryx Sonnerati (Banded Bay Cuckoo).

III.—Sexes dissimilar ; upper plumage metallic green or bronze ; wing about 4·4.

Chrysococcyx maculatus (Emerald Cuckoo).

IV.—Plumage black ; appearance mimics that of the Drongo ; wing about 5.

Surniculus lugubris (The Drongo Cuckoo).

B.—A distinct crest ; tarsus feathered only at the base.
Genus *Coccystes*.

(a) Wing under 6 ; upper parts black.

C. jacobinus (Pied Crested Cuckoo).

(b) Wing over 6, and mainly chestnut coloured ; a white collar.

C. coromundus (Red-winged Crested Cuckoo).

CUCULUS CANORUS (Blanford, Vol. III., p. 205 ;
Legge, p. 221).

The Cuckoo.

Description.—Adult : Upper plumage ashy-gray, paler, and tinged with bluish on the rump and upper tail coverts ; wing quills brown, the inner webs with deep notches of white ; tail feathers blackish-brown with white tips, the margin of the inner webs spotted with white, and a few white markings along the shafts. Throat and fore-neck pale ashy-gray, blending on the sides of the neck into the darker hue of the upper

plumage ; rest of lower parts and wing lining white with narrow wavy bars of brownish-black.

Young, First Stage : Feathers of upper parts dark brown, barred with rufous and edged with white. A white spot on the nape. Lower plumage broadly barred with brownish-black and white ; tail browner than in adults and more boldly spotted ; as the birds grow up the rufous bars on the upper plumage are lost, except on the wings.

Second Stage : The black bars on the under parts become narrower ; the upper plumage, wings, and tail are barred with pale rufous. As the birds reach maturity the white nape spot disappears, while ashy patches appear on the upper parts and spread until they wholly replace the rufous bars.

Bill dark horn colour, orange-yellow at the gape, and yellowish on the edges and at the base ; iris yellow ; legs yellow. In young birds the lower mandible is pale green and the iris brown.

Length about 13 ; wing 8-9 ; tail about 7 ; tarsus .8 ; bill from gape 1.2. The dimensions are variable.

Distribution.—The Common English Cuckoo is one of our rarest hill migrants. Two or three specimens have been obtained during the north-east monsoon in Dikoya and Kotmale and Layard once shot a specimen in Colombo while migrating. It is found practically over the whole of the Old World, breeding in the north and centre of its range, and wintering in the tropics, occasionally going as far south as Australia.

Habits, &c.—Should be looked for on the borders of woods. The well-known call is uttered only by the male in the breeding season, so is not likely to be heard in Ceylon. In flight and appearance it is singularly like a hawk. It feeds on caterpillars, grubs, and insects.

CUCULUS POLIOCEPHALUS (Blanford, Vol. III., p. 208 ;

Legge, p. 231).

The Small Cuckoo.

Description.—Adult : Very similar to the last species, but considerably smaller ; the black bars on the breast are broader.

Young birds pass through three stages. In the nestling plumage the feathers of the upper parts are blackish-brown with white margins ; chin and throat almost wholly black ; rest of lower parts white broadly barred with black.

Second Stage : Chin and throat imperfectly barred with white and tinged with rufous ; the white margins on the upper plumage become smaller, while a white spot, sometimes extending to a half collar, appears on the nape.

Third Stage : The white disappears from the nape ; the upper parts become bright chestnut with black bars, as the birds approach maturity the black bars disappear from the neck, rump, and tail coverts, while the throat and breast are tinged with rufous.

Lastly, the ashy adult plumage appears in patches which spread. All the changes from one phase to another are gradual.

Bill blackish, the gape and the base of the lower mandible yellow ; iris brown ; legs and feet yellow.

Length about 10 ; wing about 6 ; tail 5-6 ; tarsus .75 ; bill from gape 1.

Distribution.—Breeds in the Himalayan countries, China, and Japan. In winter it migrates southwards, and has occasionally been recorded from Ceylon. It also occurs in Madagascar and Africa south of the Equator.

Habits, &c.—Appears to be a very tame bird, “frequenting low trees and stunted jungle near open places” (*Legge*). The cry appears to be uttered only in the breeding season, and is a loud, harsh call of several syllables.

CUCULUS MICROPTERUS (Blanford, Vol. III., p. 210 :

Legge, p. 228).

The Indian Cuckoo.

Description.—Adult : Upper plumage ashy-brown, grayer on the back of the neck and head ; the wing quills have deep notches of white on the inner webs. Tail light smoky brown, with a broad dark sub-terminal bar and a white tip. The tail feathers also have white or buff marks on the edges, and on the shafts white spots, which on the outer feathers form irregular bars. Throat and neck pale gray, sides of the face

darker ; rest of lower parts creamy white with broad black bars. The bars are narrower and more distant on the under tail coverts and wing lining.

Females are browner on the throat and neck.

Immature birds are brown above ; the head and neck mottled with white and rufous ; the feathers of the back and wings tipped with rufous ; lower parts buff, barred with dark brown ; the markings on the tail are more rufous and banded. The change to adult plumage is gradual.

Bill horny black, the lower mandible fleshy ; iris brown ; legs yellow.

Length about 12·25 ; wing about 7·5 ; tail 6·25 ; tarsus ·8 ; bill from gape 1·25.

Distribution.—Said to be rare in Ceylon, and apparently a migrant. Specimens have been recorded from various localities both in the low-country and in the hills. In the breeding season it is found in the Himalayas and Assam hills, and ranges north to Eastern Siberia, China, and Japan. In winter it is found over most of India, though rarer in the south, and extends south-eastwards through Burma, &c., to the Malay Archipelago.

Habits, &c.—This species has a very hawk-like appearance. It keeps to the tops of trees in tall forest, especially on hill slopes, and is a very shy bird. The call is described as a melodious double note of two syllables in each part, represented by its Bengali name of “Boukotako.” It may be the bird whose call is not uncommonly heard in the Eastern Province, where it is known as “Captain Philpots.” I have also heard this call in the Medagama hills and near Polonnaruwa, but have never seen the bird or met any one who has done so.

HIEROCOCCYX VARIUS (Blanford, Vol. III., p. 213 ;
Legge, p. 240).

The Common Hawk Cuckoo.

Description.—Adult : Upper plumage dark ash-gray, darkest on the back and palest on the rump and upper tail coverts. Wing quills browner, with broad white bars on the inner webs ; tail ash-brown crossed with four or five bars of blackish-brown, each of which is bordered behind with a pale rufous

band. Lores, cheeks, and ear coverts bluish ash colour ; chin and throat whitish ; fore-neck and breast rufous mixed with pale ash colour ; the rest of the lower parts shade from rufous on the breast to white on the lower tail coverts, and are barred with ashy-gray.

Young birds are dark brown above with rufous crossbars ; the lower parts are tinged with rufous and marked from the throat to the abdomen with rufous-brown drop-shaped markings ; tail as in adults, but more rufous. The adult plumage is gradually assumed.

Bill horny black on the upper mandible, lower mandible and gape yellowish ; iris in adults yellow or orange, in young brown ; legs and feet yellow.

Length about 13·5 ; wing 7·5 ; tail 6·75 ; tarsus ·95 ; bill from gape 1·25. Dimensions are rather variable, and females are smaller than males.

Distribution.—A migrant to Ceylon, arriving early in November, and making at once for the hills. It is found as a resident over all India westward of the Bay of Bengal, except in the Punjab, Sind, and Assam.

Habits, &c.—This is the true “Brain-fever Bird.” Its cry is a piercing “pīpee-ha,” repeated several times in an ascending scale. In Ceylon it is found in big jungle, especially on the borders of the grassy “eliyas” in the higher ranges. It does not appear to be very abundant.

CACOMANTIS PASSERINUS (Blanford, Vol. III., p. 216).

CUCULUS PASSERINUS (Legge, p. 235).

The Indian Plaintive Cuckoo.

Description.—Adult : Upper plumage dark ash colour with a greenish gloss on the mantle. Wing quills brown, with a white patch near the base of the inner webs. Tail feathers nearly black, with white tips and oblique bands of white on the inner webs, most noticeable on the outer feathers. Lower plumage ashy, paler on the abdomen ; the edge of the wing, the vent, and lower tail coverts are white.

Young birds are largely rufous, and pass through three stages. At first the upper plumage is dark glossy brown, with rufous edges to the feathers ; tail black, with broad white and

rufous bars and marks ; lower parts white, with dull brown bars ; throat and breast tinged with rufous.

Second Stage : Upper parts and sides of head and neck bright chestnut, with broad black bars on the back and wings, and a few black spots on the head, hind-neck, rump, and tail coverts ; tail feathers chestnut, with irregular black markings on the shaft and a large black patch near the tip, which is usually white.

Third Stage : The head, hind-neck, back, rump, and tail coverts lose their spots, the dark bars on the wings change to spots ; the tail feathers lose all black marks, save the patch near the end, and many of the bars on the throat and breast disappear, leaving these parts bright chestnut. Young birds can always be distinguished from the next species by their slightly smaller size, more slender bill, and by the rufous tint of the throat and breast. The change from one stage to another is gradual.

Bill dark brown ; iris reddish- or grayish-brown ; legs and feet dingy yellow or grayish.

Length about 9 ; wing 4·5 ; tail 4·5 ; tarsus ·65 ; bill from gape 1.

Distribution.—Apparently a migrant, appearing during the north-east monsoon, and wandering all over the Island. It is commonest in the drier parts of the low-country, and does not ascend to any great height. It occurs over the greater part of India.

Habits, &c.—This species frequents low and scrubby jungle, the edges of open spaces round tanks, &c. It is a restless and rather wary bird. In India during the breeding season it has a plaintive, ventriloquistic note, described by Jerdon as “ka-veer, ka-vee-eer.” During its stay in Ceylon it appears to be silent. A few birds may possibly remain and breed in Ceylon, as the species is resident over the greater part of its range in India. The eggs have been found in the nest of the Tailor Bird—*O. sutorius*. These are of a white type, rather larger than the eggs of its host, with a few reddish spots. Another type of egg is blue, with even more scanty spots. In India it also lays in the nests of the Common Wren Warbler (*P. inornata*) and the Yellow-eyed Babbler (*P. sinensis*).

PENTHOCERYX SONNERATI (Blanford, Vol. III., p. 219).

CUCULUS SONNERATI (Legge, p. 233).

The Banded Bay Cuckoo.

Description.—In this species the adult plumage remains barred, and resembles that of the immature bird. Upper plumage dark brown, lusted with green and barred with rufous; forehead more or less mottled with white; wing quills dark brown, the outer webs with a narrow rufous margin, and the inner with a broad rufous white border; middle tail feathers brown with indented rufous edges; the other feathers have white tips, and the rufous borders increase, the outermost feathers being mainly rufous with irregular brown bars. The lower parts from chin to tail coverts, together with the sides of the head and neck, are buffy-white with many narrow, wavy crossbars of dark brown; the ear coverts are darker.

Bill black above and at the tip, greenish-yellow underneath; iris brownish or yellowish-red; legs and feet brownish-slaty, or bluish-lead colour.

Length about 10; wing 5; tail 4·85; tarsus ·7; bill from gape 1·1. Females rather smaller: wing 4·75.

Distribution.—Resident in Ceylon; found almost all over the Island; commonest in the Eastern Province, but nowhere numerous. Mr. Stuart Baker informs me that the Ceylonese form is a good sub-species, recognizable at a glance from typical *P. sonnerati*, a reddish form, which occurs in India and Burma, by its almost blackish colouration. He has done me the honour of naming the Ceylon sub-species *P. sonnerati waiti*. Allied sub-species occur in Java and Malaya.

Habits, &c.—Frequents the edges of tanks where there are dead trees, also chenas and the park country. It is a shy bird, keeping to the tops of trees. It is noisy in the mornings and evenings, giving out a curious whistle, which Legge represents by “whi-whip, whi-whip—whi-whip, whi-whip.” It has also a call note, beginning in a low key, changing to a higher, and then dying away.

In India this Cuckoo is reported as laying its eggs in the nests of the Southern Red-whiskered Bulbul (*O. fuscicaudata*), a species not found in Ceylon; also in the nests of the Small

White-throated Babbler (*D. albogularis*) and the Common Bush Bulbul (*Æ. tiphia*). An egg taken from the oviduct is described as brownish-pink, speckled and freckled with reddish-brown. The size is about .76 by .63; the shape a broad blunt oval, slightly pointed at one end. The texture is smooth and fine and somewhat glossy.

CHRYSOCCOXYX MACULATUS (Blanford, Vol. III., p. 222).

CUCULUS MACULATUS (Legge, p. 238).

The Emerald Cuckoo.

Description.—Adult Male : Head, neck, upper breast, and upper parts glossy green tinged with bronze ; wing quills brown ; a white patch on the basal portion of the inner webs of most of the primaries ; outer tail feathers tipped with white, the outermost pair with three white bars ; lower breast, wing lining, and abdomen banded with white and metallic green or bronze ; under tail coverts green with narrow white bars.

Females and Immature Males : Crown and back of neck pale rufous, generally barred with white and dark brown ; back, wings, and tail metallic green tinged with yellow or coppery bronze ; wing quills brown with rufous patches on the inner webs ; central tail feathers tipped with coppery bronze ; outer feathers barred with chestnut and black and tipped with white ; under surface barred white and copper.

Bill orange-yellow, black at the tip ; iris red-brown ; legs and feet reddish-brown.

Length 7 ; wing 4.4 ; tail 2.9 ; tarsus .6 ; bill from gape .85.

Distribution.—The specimen figured in Brown's "Illustration of Indian Zoology, 1776," is said to have been obtained in Ceylon by the Dutch Governor Loten. As the bird has never been seen in the Island since, its place in the Ceylon list is a little doubtful. It occurs in the Lower Himalayas and the Assamese hills, and ranges eastward through Burma and Malaya to Sumatra. It is nowhere common.

Habits, &c.—This species keeps to the tops of trees in forest. It feeds entirely on insects.

SURNICULUS LUGUBRIS (Blanford, Vol. III., p. 223 ;
Legge, p. 243).

The Drongo Cuckoo.

Description.—Adult: Black all over, with a green and purple gloss, which is brightest on the upper plumage; there are white patches on the inner webs of the primary quills; the outermost tail feathers are crossed with slanting bars of white, and there are a few white spots on the next pair; there is also a little white on the thighs and lower tail coverts.

Fledglings are speckled all over with white, each feather, except the wing quills, being marked with a clear white spot on the centre near the tip; these white spots gradually disappear, but often a few spots remain after maturity on the nape and upper tail coverts.

Bill black; iris brown; legs blackish. Length about 10; wing 5.1; tail 5.5 to end of longest quill; tarsus .60; bill from gape 1.0.

Distribution.—Locally distributed throughout the low-country and up to about 4,000 feet; in some districts it is possibly a partial migrant. In the peninsula of India it is very rare, but it is commoner on the Himalayas west of Nepal, and ranges through Burma to Borneo and Java.

Habits, &c.—This species frequents the undergrowth and low branches of trees throughout the northern forest tract; it is also found in scrub jungle, chena clearings, and on patanas dotted with trees. It is by no means shy. The call, heard chiefly during the north-east monsoon, is a clear whistle of six ascending notes. The food consists of seeds, as well as of caterpillars and beetles. As the adults in their appearance closely mimic Drongos, it was for long supposed that this species deposited its eggs in the nest of the Drongo. It will be seen, however, that the fledgling is most unlike that of the Drongo, and I have lately obtained clear evidence that in Ceylon this Cuckoo lays in the nest of the Black-fronted Babbler (*R. nigrifrons*), as in May, 1917, in the Puttalam District, a nest of this species was brought to me tenanted by a young Drongo Cuckoo. Previously to this, Mr. E. C. Stuart Baker had seen a strange egg taken by me from a Black-fronted Babbler's nest and had assigned it tentatively to this

Cuckoo. This egg was taken in the Southern Province also in May. In shape it is an elliptical oval, measuring .83 by .61. The ground colour is white, with a very faint pink tinge, fairly profusely spotted with reddish-brown and dull inky purple. This Cuckoo may also possibly lay in the nests of the Bush Bulbul (*Æ. tiphia*).

COCOYSTES JACOBINUS (Blanford, Vol. III., p. 225 ;

Legge, p. 246).

The Pied Crested Cuckoo.

Description.—Adult : Upper plumage and sides of the head black, glossed with green and purple. Wing quills brown with a broad white band across them ; the tail feathers have white tips, which on the central feathers are narrow and tend to be abraded ; under parts and wing lining dirty yellowish-white.

Immature birds are brown above ; the markings on the wings and tail are buff ; the chin and throat are gray ; remainder of lower parts buff.

Bill black ; iris reddish-brown ; legs leaden blue.

Length 12 to 13 ; wing 5.5 to 6 ; tail about 6.5 ; tarsus 1.0 ; bill 1.1.

Distribution.—Found fairly widely over the low-country, commonest near the sea. It is resident in the drier zone, but in the wet districts it is apparently a migrant during the north-east monsoon. It may be found up to about 3,000 feet. It occurs throughout India and Upper Burma, and ranges through South-west Asia to the whole of South Africa south of the Sahara.

Habits, &c.—Usually found in scrub jungle, the fringes of open spaces in the forest zone, and in open plains. It is generally met with singly or in pairs, but in the Hambantota District I have seen flocks of as many as twelve perched on low rushes in swampy ground and hunting for flies. The note is a distinctive high metallic whistle. The eggs are laid in the nests of the Southern Indian Babbler, *Crateropus striatus*, and the breeding season appears to be as extended as that of their host, for I have taken eggs from November to June, and again in August. I have several times found two of these eggs

in one nest, but never more. They closely resemble the Babbler's eggs in size and colour, but are generally of a slightly different shade. They are broadly elliptical in shape, sometimes with rather square ends, the shell is hard, the surface smooth, satiny, and slightly pitted, while the "white" is greenish instead of being colourless as in Babbler's eggs. The average of a dozen Ceylon eggs is $\cdot 94$ by $\cdot 76$.

COCYSTES COROMANDUS (Blanford, Vol. III., p. 226 ;
Legge, p. 249).

The Red-winged Crested Cuckoo.

Description.—Crown, nape, and sides of head black ; a blue-green gloss on the longish crest ; a clearly marked half collar of white on the hind-neck. The back, scapulars, inner wing coverts, and tertiaries are black glossed with green ; the remaining coverts and the wing quills chestnut ; rump, upper tail coverts, and tail black, the two former glossed with green, the last with purple ; outer tail feathers narrowly tipped with white. The throat and fore-neck are chestnut-buff ; breast and upper abdomen white ; lower abdomen, vent, and thighs dusky gray ; under tail coverts black glossed with violet.

In young birds the feathers of the upper parts are tipped with rufous ; chin and throat whitish ; under tail coverts and edges of the tail feathers buff.

Bill black ; iris hazel brown ; legs and feet lead colour.

Length 15 to 16 ; wing about 6·4 ; tail 9·5 ; tarsus 1 ; bill from gape 1·4

Distribution.—A rare bird, found here and there throughout the Island up to about 4,000 feet. The majority of the specimens appear to be migrants, arriving in October and leaving about Easter, but it is possible that in the northern forest tract some birds stay all the year round, and I have an egg found in the Puttalam District, which probably belongs to this species. This Cuckoo is very rare in the Indian Peninsula, but ranges from Nepaul, through Assam and Burma, to China and the Malay Archipelago.

Habits, &c.—Found singly or in pairs in thick scrub and thorny jungle. It feeds on caterpillars, beetles, &c. In the north of the Island the eggs may be looked for in the nests of

the Southern Indian Babbler, *C. striatus*, or possibly in those of the Magpie Robin, *Copsychus saularis*. They resemble those of the last species, but are larger and of a slightly paler blue. An egg from near Puttalam, which probably belongs to this species, measures 1·04 by ·83. The average size of Indian eggs is about 1·06 by ·90.

Sub-family *Phœnicophainæ*.

Koels and Coucals.

The Koels, Malkohas, and Coucals are a cuculine group, typically represented in Ceylon by the familiar Crow Pheasant, frequently but erroneously termed the "Jungle Crow" and the Koel. They are all birds of moderate size, with short, rounded wings and long, broad tails; the bill is generally stout, and the upper mandible much curved; the tarsus is always naked. Most of them are ground feeders, and are found in thorny scrub, thick jungle, or long grass. Their powers of flight are poor, but they slip through tangled thorn bushes and undergrowth with surprising ease. The Koel, *Eudynamis honorata*, like the true Cuckoos, is parasitic in its nesting habits, and its eggs approach in colour and markings those of the crows, in whose nests it lays. The other members of the sub-family build their own nests and lay chalky-white eggs. Seven species representing five genera are found in Ceylon. Several of them are rare or local, while one—*Phœnicophæus pyrrhocephalus*—placed in a genus by itself, is peculiar to the Island.

Rough Key to Ceylon Phœnicophainæ.

A.—Tail and wing measurements equal; male glossy black; female glossy brown speckled with white.

Eudynamis honorata (Koel).

B.—Tail measurement longer than that of wing.

I.—Tail tipped with white.

(1) Upper plumage gray, glossed with green; naked skin of face bluish.

Rhopodytes viridirostris (Small Green-billed Malkoha).

- (2) Upper plumage glossy green ; naked skin of face red.

Phœnicophæus pyrrhocephalus (Red-faced Malkoha).

- (3) Plumage sandy brown ; back and breast feathers spiny.

Taccocua leschenaulti (The Sirkeer Cuckoo).

II.—Plumage black ; wings chestnut. Genus *Centropus*

- (a) Wing lining black.

- (1) Bill black.

C. sinensis (Common Coucal).

- (2) Bill green.

C. chlororhynchus (Ceylonese Coucal).

- (b) Wing lining chestnut.

C. bengalensis (Lesser Coucal).

EUDYNAMIS HONORATA (Blanford, Vol. III., p. 228 ;

Legge, p. 251).

The Indian Koel.

Description.—Male : Black all over with a bluish-green gloss.

Female : Upper plumage brown with an olive gloss ; the head, black, and wing coverts speckled, and the wing and tail quills barred with white ; throat and fore-neck brown with white streaks, which change to wavy crossbars on the rest of the lower parts.

Young birds at first are black like the males, then become barred and spotted like the females, only the spots and bars on the upper plumage are rufous. Males then gradually assume their adult plumage, and females their adult markings.

Bill dull green ; iris crimson ; legs plumbeous.

Length about 16 ; wing 7·5 ; tail about 7·5 ; tarsus 1·2 ; bill from gape 1·5.

Distribution.—Common all over the low-country, but rather more local in the north than in the south. It appears to wander about to some extent, but does not ascend the hills to any great height. It occurs practically all over India, except on the higher slopes of the Himalayas, and ranges through Burma to China and the Malay Archipelago.

Habits, &c.—A noisy bird, familiar to most people in Ceylon. Its cry of "kuil, kuil" is uttered most persistently during the breeding season; the male has another call "ho-iy-o." The birds skulk from tree to tree, and seldom remain long in the open. They feed on fruit for the most part. The breeding season is in June and July. Near the coast, where the Gray Crow is found, the eggs are laid in the nests of that species, elsewhere in the nests of the Black Crow. As many as five Koel's eggs have been found in one Crow's nest, and I have several clutches of four. They are noticeably smaller than Crow's eggs, and, as a rule, more dumpy. The ground colour is a grayish- or brownish-green, blotched and spotted with reddish-brown. The average size of a fair Ceylon series is 1·23 by ·94.

RHOPODYTES VIRIDIROSTRIS (Blanford, Vol. III., p. 231).

ZANCILOSTOMUS VIRIDIROSTRIS (Legge, p. 258).

The Small Green-billed Malkoha.

Description.—Upper parts gray with a greenish gloss, most noticeable on the wings and tail; tail broadly tipped with white; under parts ashy; the feathers of the throat and fore-neck are forked, which gives these parts a streaky appearance; the breast and abdomen are more or less tinged with rufous.

Bill pale leaf-green; iris blood-red; a small naked patch of bluish skin round the eye; legs dusky greenish or bluish.

Length about 15·5; wing 5·25; tail 8·5 to 9·5; tarsus 1·35; bill from gape 1·35.

Distribution.—Found all over the low-country, but most numerous in the drier parts of the Island. It does not appear to ascend the hills to any great height. It also occurs in the southern half of the Indian Peninsula.

Habits, &c.—Found in thickets and thorny scrub, flitting through the bushes, but seldom coming out into the open. It feeds on both fruit and insects. The breeding season appears to extend throughout the year, as I have taken eggs from January to November. The nest is rather a flimsy structure of twigs placed at no great height from the ground in a thorny bush. It often contains a sprig of green leaves, on which two

or sometimes three eggs are laid. The bird sit fairly close. The eggs are blunt ovals with little difference between the two ends. They are dull white, and chalky in texture. Average size 1·21 by ·96.

PHŒNICOPHÆS PYRRHOCEPHALUS (Blanford, Vol. III., p. 234 ; Legge, p. 255).

The Red-faced Malkoha.

Description.—Crown, sides, and back of neck black, glossed with green and streaked with white ; remainder of upper plumage deep glossy green, the wing quills and tail with a bluish lustre ; tail feathers with long white tips, longest on the outer feathers ; chin and feathered portion of cheeks white with black shaft streaks ; throat and fore-neck glossy black ; remainder of lower parts white.

The feathers of the head and neck are forked ; the whole side of the face from the bill to the ears is covered with a short stiff crimson growth resembling rudimentary feathers.

Young birds have only a bare brick-red naked patch round the eye ; the streaks on the crown are dull gray ; the black feathers on chin and throat are streaked with white ; the tail feathers are shorter and less broadly tipped with white than in adults.

Bill apple-green, paler below ; iris in males brown, in females white ; legs and feet bluish.

Length about 18 ; wing 6·25 ; tail 11 ; tarsus 1·4 ; bill from gape 1·55.

Distribution.—Peculiar to Ceylon ; found in thick forest and heavy jungle over most of the medium and wet zones. It ascends the southern hill ranges as high as Haputale.

Habits, &c.—A very shy bird, not uncommon in the wilder stretches of forest, but seldom seen near cultivation. It feeds mainly on fruit, and travels about in small parties. The breeding season appears to be about May. The nest probably resembles that of the preceding species. The eggs, two or three in number, are also similar, but slightly less chalky on the surface. They are short broad ellipses, practically the same at both ends. Average measurement about 1·40 by 1·04.

TACCOCUA LESCHENAULTI (Blanford, Vol. III., p. 237

Legge, p. 266).

The Sirkeer Cuckoo.

Description.—Upper plumage olive or sandy brown, with a gray-green gloss on the back and wings; the shafts of the feathers on the head, neck, mantle, and chest are glossy black and spiny. The middle tail feathers are of the same colour as the back, the others blackish with broad white tips. The chin and throat are pale buff or whitish; fore-neck and upper breast darker and grayish or brownish; remainder of lower plumage rufous, and much darker in some birds than in others.

Bill cherry-red with a yellowish tip; iris reddish-brown; feet lead colour.

Length about 16; wing 6.1; tail 8.60; tarsus 1.6; bill from gape 1.4.

Distribution.—Found mainly in the tract between the Haputale hills and Hambantota, also on the eastern slopes of the Uva and Central Province ranges and the park country at their foot. Fairly widely distributed in the Indian Peninsula, but nowhere common.

Habits, &c.—A shy bird, found chiefly in the long grass of the patanas and park country. It feeds almost entirely on the ground. In South India the birds breed in March and April. The nest is a loose cup of twigs lined with green leaves.

The three chalky-white eggs measure about 1.39 by 1.07.

CENTROPUS SINENSIS (Blanford, Vol. III., p. 239).

CENTROPUS RUFIPENNIS (Legge, p. 260).

The Coucal, Crow Pheasant, or Jungle Crow.

Description.—The entire plumage, except the wings, wing coverts, and scapulars, black with a metallic gloss, which is mainly purple on the hind-neck, back, and breast, and bluish-green on the tail. The wing coverts, scapulars, and, in some specimens, the inter-scapulars are chestnut. The tips of the quills are dusky, the wing lining black.

Young birds are duller; the upper parts are marked with bars and spots of rufous or white; the wings and coverts are barred with black, the tail is dark brown with narrow whitish bars; the lower parts dull black with grayish-white bars.

Albino specimens sometimes occur. Legge notices one in which the body was white and the wings light brown, and there is a pure white chick in the Colombo Museum collection.

Bill black ; iris crimson ; legs black.

Length 18 ; wing about 7·7 ; tail 9·75 ; tarsus 1·9 ; bill from gape 1·75.

Distribution.—Found all over the Island, Blanford unites in one species three fairly well-marked races which occur respectively in Peninsular India, Northern India, and the country from Assam to Burma ; the last race is identical with typical *Centropus sinensis* from China.

Habits, &c.—Found everywhere, except in the heart of heavy forests. It feeds on the ground on insects, small reptiles, &c., and is not averse to the eggs and young of smaller birds. It can run with considerable speed. The flight is slow and heavy. The cry is a resounding “kook-kook-kook.” The breeding season continues from March till about September. The nest is a large globular affair of sticks, dry leaves, and grass, placed in a thick bush or thorny tree. The three chalky-white eggs are broad, oval in shape, and measure about 1·34 by 1·14.

CENTROPUS CHLORORHYNCHUS (Blanford, Vol. III., p. 242 ;
Legge, p. 263).

The Ceylonese Coucal.

Description.—Similar to the last species, only rather smaller and slighter : the gloss on the breast, hind-neck, and upper back is purple and bronze ; the wing coverts and wings are darker chestnut, and the quill tips more dusky ; the feathers of the crown and nape are longer and looser, and the bill pale instead of black. The young have no distinct plumage.

Bill pale apple-green ; iris deep red or dull crimson ; legs and feet black.

Length about 17 ; wing 6·4 ; tail 9·25 ; tarsus 1·75 ; bill 1·7.

Distribution.—Peculiar to Ceylon, and practically confined to the tract between the Deduru-oya and the Nilveli-ganga. It ascends the western slopes of the hills to about 2,500 feet. It is commonest in the dense forests of the Western Province and Ratnapura District, where the rainfall is heavy.

Habits, &c.—An inhabitant of the deep jungle, where the undergrowth is thick and tangled. It very seldom emerges into the open. The cry is a sonorous “hoo-whoop-whoop,” given out in the morning and evening, or after rain.

The breeding season appears to last from April to July. The nest and eggs are similar to those of the last species, only a little smaller.

CENTROPUS BENGALENSIS (not in Legge ; Blanford,

Vol. III., p. 243, and Vol. IV., p. 485).

The Lesser Coucal.

Description.—Considerably smaller than either of the last two species, but the adult is similarly coloured ; the gloss on the body plumage is purplish, and on the tail green ; the wings are deep chestnut ; the wing lining, however, is chestnut, and not black.

Young birds at first are dark brown, spotted with rufous on the head and neck, and barred with rufous on the back, wings and tail ; under parts rufous-white, with dark spots on the throat and dark bars on the abdomen.

Second Stage : Sides and top of head and neck, the back, scapulars, and wing coverts brown with white on the shafts ; the upper tail coverts are lengthened, and they and the rump are narrowly barred with black ; wings and tail as in adults, save that the tail feathers are tipped with rufous and the wings are more dusky ; lower parts are rufous-white speckled with dark brown on the throat, and with narrow dark bars on the lower abdomen, flanks, and tail coverts. The changes from one phase to another are gradual.

Adults : Bill and legs black ; iris crimson. In the young the bill and iris are yellowish, legs lead colour.

Length about 13 ; wing 5·4 ; tail 7 ; tarsus 1·6 ; bill from gape 1·1. Females are larger : length 14·5 ; wing 6·7.

Distribution.—Mr. A. L. Butler found in the collection of a native dealer a single skin procured in the North-Western Province in April, 1896. It is possibly a rare resident. The species is found in a few localities in Peninsular India. It is commoner in Bengal, and ranges through Burma to Southern China and Malaya.

Habits, &c.—Somewhat similar to those of the common Crow Pheasant, but this species is found mainly in high grass. It feeds largely on grasshoppers. In India the breeding season lasts from May to August. The nest is a domed structure of long grass woven in among growing grass stems. Two or three chalky-white eggs are laid, measuring about 1·17 by 1·01.

Order PSITTACI.

Family PSITTACIDÆ.

Parrots.

The Parrots form a distinct order, whose nearest affinities are with the Owls and Hawks. The feet are zygodactylic ; the bill is short, stout, and boldly hooked, the upper mandible is loosely articulated to the skull and is movable ; the base of the bill is covered by a cere of fleshy skin ; the tongue is thick and fleshy. All species lay white eggs in a hollow excavated in the stem or branch of a tree. The young are naked when hatched. Parrots are found all round the world, mainly in the tropics, but one species occurs as far north as Carolina, United States of America, others as far south as New Zealand and Patagonia. They all have more or less the same habits, feeding on fruits and seeds and going about in flocks. The flight is swift and straight, and the cry a harsh scream. They are not well represented in India, as only three genera belonging to one family are found within Indian limits. In Ceylon we have four species of the genus *Palæornis* and one species of *Loriculus*. Out of these five species three are peculiar to the Island.

Rough Key to Ceylon Parrots.

A.—Tail long ; the middle feathers much longer than the rest. Genus *Palæornis*.

(a) Head and body green ; males with, females without, a rose collar on hind-neck.

(1) A large red patch on wing coverts ; wing about 8.

P. eupatria (Large Ceylonese Paroquet).

(2) No red patch on wing coverts ; wing about 6·3.

P. torquatus (Rose-ringed Paroquet).

(b) Head and neck not green, or not wholly green.

(1) Head, in males red with a purple bloom, in females bluish-gray; upper back green.

P. cyanocephalus (Blossom-headed Paroquet).

(2) Crown and upper back gray; a bright green collar on neck.

P. calthropæ (Layard's Paroquet).

B.—Tail short: size small; length about 5·5.

Loriculus indicus (Ceylonese Loricet).

PALÆORNIS EUPATRIA (Blanford, Vol. III., p. 247:

Legge, p. 168).

The Large Ceylonese Paroquet.

Description.—Male: Upper plumage grass-green, most vivid on the forehead, lores, and rump, and darker on the wings; a faint dark stripe from the nostril to the eye; a rose-pink collar round back and sides of neck, met by a broad black stripe, which runs from the side of the neck to the lower mandible. The nape just in front of the collar has a grayish-blue bloom. A large dark-red patch on the secondary wing coverts; the first primary and the inner webs of the remaining quills are dark brown. The central tail feathers pass from green at the base into verditer blue, the tips being yellow. Lower plumage dull pale-green, brightening a little on the flanks and abdomen; wing lining and lower tail coverts pale green; lower surface of tail dull yellow.

Females and young lack the rose collar and black mandibular stripe.

Bill deep red, paler at the tip; iris pale yellow with a bluish-gray inner circle; legs and feet greenish or grayish lead colour.

Length about 19; wing about 8; tail up to 11·5: tarsus ·75; bill from cere 1. Females rather smaller.

Distribution.—Peculiar to Ceylon, but closely allied forms with probably only sub-specific differences occur throughout the greater part of India and Burma. It is widely, but rather locally, distributed throughout the low-country, and is most numerous in the maritime districts of the northern half of the Island; rare above 1,000 feet, but occasionally found at higher elevations.

Habits, &c.—Found in flocks, generally round villages where coconut plantations border on forest and jungle. The birds usually roost in colonies in coconut groves, flocking with loud screams towards their roosting ground just before sunset. They feed on fruit, berries, and seeds.

The breeding season is from November to about March. The birds usually select natural holes in trees on the outskirts rather than in the interior of forests, increasing these holes to a suitable depth and size. Two to four white glossless eggs are laid. Average size about 1·2 by ·95.

PALÆORNIS TORQUATUS (Blanford, Vol., III., p. 250 ;
Legge, p. 171).

The Rose-ringed Paroquet.

Description.—Smaller, but very similar to the last species, and with the same sexual differences in the plumage. The present species, however, lacks the red patch on the wing coverts, and there is little or no yellow on the tips of the central tail feathers. In the males the rose collar is generally paler and narrower, and the bluish-gray bloom on the neck in front of it is more pronounced. In some birds the green plumage is tinged in places with yellow.

Bill, upper mandible red, lower mandible blackish ; iris pale yellow ; legs and feet dusky slate colour or greenish.

Dimensions are very variable : length about 15 ; wing 6·3 ; tail 9 ; tarsus ·6 ; bill from cere ·85.

Distribution.—The most abundant species over the greater part of the low-country, except in the wet zone ; it is not found at any great elevation. It occurs throughout India ; and ranges through Pegu to Cochin-China.

Habits, &c.—Found in flocks about villages and in open lands or scrub jungle near coconuts. Like the last species, it roosts in dense flocks in coconut groves, and is very noisy when flying home in the evening.

The breeding season is from Christmas time to about April. Four or five white eggs are laid in a hole in a tree. Ceylon eggs appear to be smaller than Indian, two in my collection measure 1·15 by ·85.

PALÆORNIS CYANOCEPHALUS (Blanford, Vol. III., p. 251 ;
Legge, p. 174).

The Western Blossom-headed Paroquet.

Description.—Male : Head red, tinged with a purple bloom on the nape and lower cheeks ; chin, throat, and a narrow collar round the neck black ; adjoining this collar the sides of the neck and the hind-neck are verdigris green ; back and scapulars olive-green ; wing coverts green with a wash of verdigris ; a red patch on the middle coverts ; inner wing quills green with pale edges and dusky black shafts and inner margins ; the black increases on the outer quills, the first primary being almost wholly black ; rump verdigris green. The central tail feathers are blue with greenish bases and broad white tips ; in the next pair only the outer web is blue, the inner web being yellowish-green and the tip yellow ; in the remaining feathers the outer web is green, the inner web and tip yellow. Lower plumage yellowish-green.

Females : Head slaty with a blue bloom on the crown and nape ; the black collar and throat patch are lacking, being replaced by a yellowish-green ring round the neck ; no red patch on the wing coverts.

Young birds are green all over, and gradually assume the coloured hood.

Bill, upper mandible orange-yellow, lower blackish-white or yellowish ; iris white or yellowish-white ; legs and feet dusky green.

Length about 13·5 ; wing 5·20 ; tail about 7·5 ; tarsus ·5 ; bill from cere ·6. Females a little smaller.

Distribution.—Common in many parts of the low-country, but avoids the coast, and is distinctly scarce and local in the northern forest tract. In the hills it is fairly common up to 4,000 or 5,000 feet. It is found in suitable districts throughout the greater part of India westwards of the Bay of Bengal.

Habits, &c.—This species feeds largely on grain and native vegetables, and is found mainly round paddy fields and in jungle chenas. Up-country it is partial to hillside patanas.

The breeding season is from February to May ; the nest hole is excavated generally in the smaller limbs of dead trees. The eggs are white and glossless. They are usually four in number, and average 1·0 by ·81.

PALÆORNIS CALTHROPÆ (Blanford, Vol. III., p. 256 ;
Legge, p. 177).

Layard's Paroquet.

Description.—Male : Forehead, lores, and a patch round the eye green ; rest of head, nape, and upper back bluish-gray ; lower back and upper tail coverts bluer ; a broad emerald collar on the neck ; chin and a broad stripe on the side of the neck dusky black ; lower parts bright green ; under tail coverts yellowish ; wing coverts green, the smaller secondary coverts rather yellower ; wing quills as in the preceding species, only the pale edges are not so noticeable ; tail feathers a beautiful deep blue with yellow tips, the outer feathers washed and edged with green.

Bill, upper mandible coral-red with a yellowish tip, lower dusky red ; iris greenish or yellowish-white ; legs and feet greenish or lead-coloured.

Females are of a duller green on the face, and the upper mandible is black. Young birds are green throughout, except the tail, which is blue.

Length about 12 ; wing 5·5 ; tail 6 ; tarsus ·6 ; bill from cere ·7. Females a little smaller.

Distribution.—Peculiar to Ceylon. The common Paroquet of the hill-country, but rather local, and in some localities replaced by the Blossom-headed Paroquet. It also extends into the forests at the foot of the hills.

Habits, &c.—A forest bird feeding on jungle fruits, such as wild figs and wild cinnamon, also on flower buds. It is found in fair-sized flocks on the outskirts of woods, in open spaces in the jungle, and in the wooded gorges of patanas. The cry is harsher than that of the last species. The breeding season lasts from January to May ; the nest and eggs are of the usual type.

The nest hole is often in dead coconut trees, sometimes high up in big forest trees. The eggs are from one to three in number, the texture is dull and rather soft and porous. Average size about ·97 by ·78.

Note.—*Palæornis columboides* (The Blue-winged Paroquet) is said to have been recorded from Ceylon, but probably in error. It is a hill species, more or less of the same type as *P. calthropæ*,

and occurs in the hill forests of the Malabar Coast. It may be recognized by the blue wing quills, and by the fact that the breast as well as the crown and upper back are dove-gray in males and greenish-gray in females. Length about 15; wing 6·5; tail 8·5.

LORICULUS INDICUS (Blanford, Vol. III., p. 262;

Legge, p. 180).

The Ceylonese Loriquet.

Description.—General colour of upper parts green; crown deep red passing into orange on the nape; back and scapulars faintly washed with orange; rump and upper tail coverts deep red; wings and tail rather deeper green; inner webs of wing quills dusky black, the outer primary almost wholly black; cheeks and lower plumage paler green, the throat faintly washed with blue: under surface of wing and tail quills verditer blue.

In young birds the crown is green, the crimson tint being assumed gradually.

Bill orange-red, paler at the tip, cere yellow, iris white, legs and feet dusky yellow.

Length 5·5; wing 3·7; tail 1·75; tarsus ·45; bill from cere ·5.

Distribution.—Peculiar to Ceylon, widely distributed in many parts of the low-country, commonest in the south-west of the Island, almost wholly absent from the arid maritime region, and local in the northern forest tract. It is common in the hills up to about 4,000 feet, and during the north-east monsoon is found at even higher elevations.

Habits, &c.—Found in native gardens or in any jungle which contains the fruit and flowers on which it feeds. It is a ravenous eater, and is especially fond of kitul toddy, on which it will gorge until stupefied. The flight is swift; the cry is a shrill little scream. The breeding season lasts from March till June. For its nest it chooses a small natural cavity in a tree, excavating the interior to a depth of 2 to 4 feet. The clutch consists of two or three eggs laid on a pad of green leaves spread about an inch thick at the bottom of the hole. They are white and glossless, and measure about ·75 by ·62



FIG. 1



FIG. 2



FIG. 3

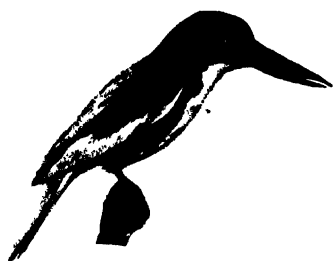


FIG. 4.



FIG. 5

FIG. 1.—XANTHOLEMA HÆMATOCEPHALA

FIG. 3.—MEROPS VIRIDIS.

FIG. 2.—CORACIAS INDICA.

FIG. 4.—HALCYON SMYRNENSIS.

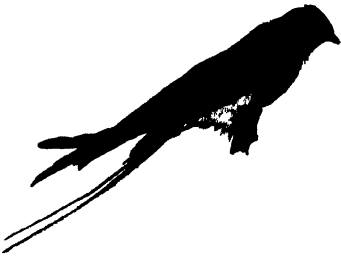


FIG. 1.

FIG. 2.



FIG. 3.

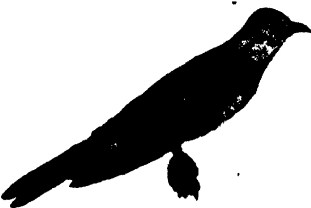


FIG. 4.



FIG. 5.

FIG. 1.- MACROPTERYX CORONATUS

FIG. 2.- CAPRIMULGUS INDICUS

FIG. 3 - HARPACTES FASCIATUS

FIG. 4 - CUCULUS MICROPTERUS.

THE MIGRATION OF BIRDS AND CEYLON MIGRANTS.

By W. E. WAIT, M.A., F.Z.S.

THE migration of birds may roughly be defined for general purposes as the seasonal movements of those birds which spend the winter and the breeding season in different regions. These seasonal movements are well known in all countries, and references to them may be found in the literature of all ages. There is an allusion in Job to the migrant Hawk ; the Greek poets Anacreon and Homer speak of the migration of the Crane and the Swallow ; the arrival of the Cuckoo and the Swallow with the returning spring in England, and of the Stork in Continental Europe, are constant themes in folklore and proverb. In Ceylon the advent of the Snipe and other birds in autumn and their departure from the Island at Easter are well known to all of us.

Many people, however, are unaware of the enormous number of birds which migrate, or of the scope and complexity of their migrations. Within the last hundred years the subject has received increasing attention, and especially within the last quarter of a century a mass of observations has been patiently recorded, chiefly in temperate climates. From these records have been deduced many clearly-ascertained facts, which have thrown much light on the question, and beyond these facts a number of theories and surmises have been propounded to account for many problems which still remain a mystery.

In temperate regions the number of species which migrate is relatively far higher than in the tropics. In England, for instance, nearly every species is migratory to a greater or less extent ; the migrants are by no means confined to those species which, like the Swallow and the Cuckoo, are purely summer residents, or, like the Fieldfare and Wild Swan, purely winter visitors.

As regards migration, the birds of a temperate climate, such as the British Islands, may be divided into five main classes :—

(1) Permanent residents, for instance, the Grouse, though even the Grouse has a short local migration from the moors, where it breeds, to the valleys, where it spends the winter.

(2) Summer residents, such as the Cuckoo, which spend the winter in warmer countries.

(3) Winter residents, such as the Fieldfare and Swan noted above. These birds breed in the far north and come in winter to the British Isles as a haven of comparative warmth.

(4) Birds of passage. In the spring hosts of birds which neither breed nor winter in the British Isles halt there for short intervals *en route* from their winter quarters in the south to their breeding stations in Scandinavia, Iceland, and Greenland. In the autumn the process is reversed.

(5) Irregular migrants and stragglers. These are birds which occur only at irregular intervals. Some species turn up fairly often in more or less regular cycles ; others, again, are vagrant oceanic rovers, such as some of the rarer Petrels, while yet others are storm-driven wanderers.

It must not be imagined that each species has a hard and fast place in only one of the above classes. Numbers of the commonest English species, such as the Song Thrush and Skylark, which many people look upon as permanent fixtures in the English landscape, have the most complex movements. Some Song Thrushes are perennial residents in the British Isles, though even among these there is a vast amount of local movement from the more exposed localities, where they breed, to more sheltered valleys, where they retreat in cold weather. Many of the Thrushes, however, are only summer residents, and winter in countries south of the Channel. Their place in winter is taken by individuals which have bred in Scandinavia and Central Europe. Other Thrushes, again, winter in France and Southern Europe, breed in Scandinavia, and occur on English shores as birds of passage. Lastly, birds which usually winter in Central Europe may occasionally be driven out of their accustomed winter haunts by unusually severe weather, and may seek temporary refuge from the cold snap in the milder English climate. Indeed, as Mr. Eagle Clarke

remarks :* "The Song Thrush furnishes us with a most excellent example of the complex nature of the phenomena of bird migration as observed in Great Britain and Ireland, and its various movements cover nearly the whole year."

What is the cause of this widespread migration, and how did the habit originate? To quote Professor Newton :† "Here . . . we are brought face to face with perhaps the greatest mystery which the whole animal kingdom presents—a mystery which attracted the attention of the earliest writers and can in its chief points be no more explained by the modern man of science than by the simple-minded savage or the poet or prophet of antiquity."

The theories are many; some more or less far fetched, but, as Mr. Eagle Clarke‡ points out, the question may best be answered by asking yet another, namely: "What would become of those myriads of birds, which in the summer delight in and breed amidst the solitude of the Arctic countries, when those vast wastes which form their feeding grounds lie under a pall of snow or are transformed into solid ice? What, too, would become of certain birds which, similarly, make our islands their summer home if they attempted to remain the winter with us?" He goes on to point out that insect feeders, such as the Swallow and Cuckoo, would perish during the English winter for want of food. Bears or various other animals solve the problem by hibernating during the winter months, and writers from Aristotle down to savants at the beginning of last century have held the theory that certain birds also hibernated, while the superstition that Swallows spent the winter in holes or even under the ice in ponds and streams was widely believed in mediæval times.

Modern observation has entirely disposed of the theory of hibernation among birds. Their power of flight enables them to escape starvation by moving to warmer climates in search of food. The reason for the autumn migration is thus then comparatively easy of explanation, but once the birds have reached their winter quarters, what is the impulse which calls them back in spring? In some cases the food problem again

* "Studies in Bird Migration," Vol. I., p. 212.

† "Dictionary of Birds," p. 549.

‡ "Studies in Bird Migration," Vol. I., p. 15.

may have something to do with it. The torrid and often parching tropical summer in many localities may lower the food supply to some extent. Again, it must be borne in mind that some northern migrants winter far to the south of the Equator, and may be warned to turn north by the approach of the southern winter. In many cases, however, these factors do not come into force, and it is probable that the breeding instinct is the main impulse which calls birds back to their summer haunts. Most birds seem greatly attached to particular nesting sites which they occupy year after year. Professor Newton records* a remarkable instance of such a persistent habit: "A pair of Stone Curlew—a very migratory species, affecting almost exclusively the most open country—were in the habit of breeding for many years on the same spot, though its character had undergone a complete change. It had been part of an extensive and barren rabbit warren, and was become the centre of a large and flourishing plantation."

It is undoubtedly the fact that many birds which have a comparatively restricted breeding area scatter widely during the winter. For instance, the Curlew Stint, *Tringa subarquata*, breeds only within the Arctic Circle on the Siberian Tundra, while in winter it is found all over the tropics, and occurs as far afield as Patagonia, Tasmania, and Cape Colony. Probably it is this attachment to accustomed breeding grounds that prevents northern migrants which visit the Southern Hemisphere from breeding a second time in their winter quarters.

A not inconsiderable number of such species "winter" in South Africa—which, of course, is then enjoying summer—at a time when the local residents are breeding. In spite of such favourable conditions, there is as yet no positive evidence that these northern migrants turn their "winter" into a second breeding season. The breeding impulse does not seem to be awakened until the season for their migration northwards sets in, by which time conditions in the South Temperate Zone are unfavourable.

As regards the origin of the migratory habit, however instinctive it may now be, it must have originated in an intelligent movement intended to escape some danger or secure

* "Dictionary of Birds," p. 553.

some advantage.* Dr. A. R. Wallace offers a probable explanation of the manner in which the habit had its origin as follows: † "It appears to me probable that here as in many other cases 'survival of the fittest' will be found to have had a powerful influence. Let us suppose that in any species of migratory bird breeding can, as a rule, be only safely accomplished in a given area; and further, that during a greater part of the rest of the year sufficient food cannot be obtained in that area. It will follow that those birds which do not leave the breeding area at the proper season will suffer and ultimately become extinct, which will also be the fate of those which do not leave the feeding area at the proper time. Now, if we suppose that the two areas were (for some remote ancestor of the existing species) coincident, but by geological and climatic changes gradually diverged from each other, we can easily understand how the habit of incipient and partial migration at the proper seasons would at last become hereditary, and so fixed as to be what we term an instinct. It will probably be found that every gradation still exists in various parts of the world, from a complete coincidence to a complete separation of the breeding and subsistence areas; and when the natural history of a sufficient number of species in all parts of the world is thoroughly worked out, we may find every link between species which never leave a restricted area in which they breed and live the whole year round to those other cases in which the two areas are absolutely separated. The actual causes that determine the exact time, year by year, at which certain species migrate will, of course, be difficult to determine."

The next problem to consider is the route by which migrants find their way between their summer and winter quarters. It must not be supposed that each bird moves indiscriminately southwards in autumn and northwards in spring. Indeed, it is by no means the case that the winter quarters are always southwards of the summer breeding grounds. For instance, owing to the gulf stream, the British Isles in winter have a milder climate than parts of Central Europe which lie

* A. P. Taverner. "Auk," Vol. XXI., 1904, p. 322.

† "Nature," Vol. X., p. 459.

further to the east, and a proportion of the Central European migrants turn their course in autumn, not south, but west, to find winter quarters in South England and Ireland. Mr. Eagle Clarke, when spending a month in autumn at the Kentish Knock lightship off the mouth of the Thames, found on the same day and hour streams of the same species, such as the Skylark, crossing the North Sea in contrary directions. Birds from the north which had followed the east coast line southward to the Thames were flitting across to the Continent from north-west to south-east *en route* for Southern Europe, while at the same time there was a steady stream of birds which had come down the Rhine delta from Central Europe and were migrating to England from east to west.*

Many observations have shown that migratory birds do not perform their journey "as the crow flies," but follow certain accustomed routes. For many species these routes coalesce, for longer or shorter distances, and form favourite fly lines. Most birds follow coast lines as far as possible.

The main fly lines used by migrants to and across the British Isles have been worked out, from a multitude of records, by Mr. Eagle Clarke, the great British authority on the subject. If you look at the map you will see that these Islands form as it were a great junction for migratory birds. It lies on the migration route of many species which breed in Greenland and Iceland on the north-west and in Scandinavia on the north-east. Let us examine some of the main routes as used in spring.

The English Channel is crossed at various points. Immigrants to Ireland and many birds on passage to Iceland and beyond take the route from Ushant to the Scillies, and from thence round the west coast of Ireland. Others, again, make their way up the coast of the Irish Sea and on through the Hebrides. Birds breeding in England and many Scandinavian birds use various crossings between the Ushant-Eddystone route on the west and the Straits of Dover on the east. The English birds on their arrival slip inland to their breeding grounds; the northerners mainly follow the coast round as

* "Studies in Bird Migration," Vol. II., Chap. I.

far as the Humber, where they begin to cross the North Sea. Few leave our shores before they reach this point in their northward journey. Many hold right on till they come to the Orkneys and Shetlands. Others, again, such as the Swallows, cross the North Sea at various points between the Humber and the north coast of Scotland.

From the Shetlands there are two main streams: one north-west to Iceland, meeting the Irish and Hebridean routes at the Faroes; and one north-east to the mainland of Norway. In autumn the process is reversed.

From observations on the Continent and in America we find that there also there are favourite fly lines: river valleys and coast lines are greatly followed. For instance, from South-west Europe there is a main route up the Rhone Valley and down the Rhine, while in the United States the Mississippi Valley is a much-used route.

It is interesting to note that for some species the spring route is not the same as that taken in autumn. This is especially well shown in the case of the American Golden Plover, *Charadrius dominicus*, whose routes have been carefully worked out by an American ornithologist.* This bird breeds in Arctic North America, from Alaska to Hudson's Bay. In autumn the flocks move south-east to Labrador, where the autumn berries give them abundant food. After a short stay there, they move on to Nova Scotia, and then cross the sea by a long journey southwards to the north-east coast of South America. It is probable that this direct sea route is the evolution of a longer coastal journey down the eastern shores of the States and round the Caribbean. On arrival on the Guiana coast the birds rest for a short time, then cross Brazil to winter quarters, mainly in the Argentine. The return journey in spring is more directly northwards, probably because the spring moves northwards earlier on the western side of the States than on the bleaker Atlantic coast. The route lies across Bolivia, through Central America, to Texas, thence up the great fly line of the Mississippi and over Western Canada.

* *Vide* Coward, "Migrations of Birds," p. 77, &c.

It will be noticed from the foregoing pages that many birds traverse enormous distances in their annual migrations. The American Golden Plover and the Curlew Stint travel between the Arctic Circle and the South Temperate Zone. Other species perform journeys not so extended, but still very wonderful when one considers how fragile and apparently weak-winged many of them are. The Himalayas and the desolate high-lying plateaux north of them are crossed by numbers of Shrikes, Pipits, and the most diminutive little Warblers. A small Australasian species of Cuckoo winters in Eastern Australia, and summers 1,200 miles across the open ocean in New Zealand; the tiny Gold-crested Wren regularly braves the crossing of the North Sea.

A rather curious fact is brought to light when examining the distances travelled by various species, and even by different birds of the same species. Birds which breed the furthest north often winter the furthest south. I have already exemplified this in the case of the Curlew Stint and Golden Plover. Here the species as a whole performs a long journey. But take the case of the European race of the common Swallow, *Hirundo rustica*. In the summer it is found breeding throughout Europe, from the Mediterranean to Scandinavia. Some specimens also breed in North Africa. The winter quarters lie in Africa, south of the Sahara right down to Cape Town but a few birds winter in the North African oases. The Swallow happens to be a day migrant, which performs its journey leisurely, and its movements northwards can, therefore, be timed accurately. Birds which breed in England begin to appear there as early as the end of March, and most of them have come by the end of April. These birds appear on the North African coast at the end of February, and through March and early April they are crossing Spain and France. Now most of the birds which winter in Cape Colony do not leave that part of the world until March, so they cannot possibly be the birds which are then crossing South-western Europe. During May, for some time after our English birds have settled down to breed, Swallows on passage are met with along the English east coast migration routes. They reach Shetland about the end of May and early June. Some breed

there, others proceed to Scandinavia. The inference is fairly obvious that our English Swallows come from the northernmost winter quarters, and that the South African birds breed in Scandinavia. In the far north nesting conditions are not favourable till June, so South African birds have no need to migrate as early as those which nest in Central Europe and England.

I have just mentioned that the Swallow is a day migrant, but this is not the case with many birds. A vast amount of the migration which takes place is unseen by us, as it is performed at night, and at altitudes and speeds which are still to a certain extent open to conjecture. The reason why birds chose night time for a long flight, especially across the sea, admits of a very probable explanation. Most birds spend a great part of the day hunting for food, so that if a bird takes an all-day flight, it must start on an empty stomach, spend an exhausting day without food, and on arrival pass another night of fasting before it can satisfy its hunger. A night flight can be taken without interfering with the feeding hours.

Various and often accidental observations by astronomers have given interesting data of the height and speed of some migrations. An observer was measuring the height and velocity of clouds when some ducks came under his notice. He calculated that they were 958 feet up, and flying at a rate of 48 miles an hour. Other records based on somewhat similar observations give heights varying from 1,400 to 5,400 feet. Mr. Eagle Clarke observed during his stay at the Kentish Knock lightship that many birds performing this North Sea journey of about 120 miles by day flew close above the waves, whatever the weather, and at no extraordinary speed. He says: "Speaking generally, the migrants pursued their way at the steady rate characteristic of their respective species. There was no hurry, but at the same time there was a business-like manner about them in keeping with the important work on hand. Certain species habitually fly faster than others. He roughly gauged the speed of the Larks at 25 miles per hour, and of the Starlings at 35 to 40.

Lastly, there remains a problem as difficult to answer as any. By what faculty do migrants find their way from point to

point and from start to finish of their journey? The great majority cannot possibly be guided by unaided sight or memory, as most of the migration takes place at night, and often over hundreds of miles of trackless ocean. Again, in many species, the young birds migrate apart from their parents, and so have no bird with actual experience of the route to guide them. The older Cuckoos leave England some weeks before the yearling birds, which have been brought up mainly in the nests of English residents and have never seen their parents. Yet the young Cuckoos hatched in England manage the long autumn trip over strange ground to their winter home which lies in Africa, south of the Sahara. There is no doubt that birds possess a special and mysterious sense of direction, known technically as "orientation," or, as Professor Newton phrases it, "inherited but unconscious experience." Explorers in Antarctic seas have come across flocks of flightless Penguins trudging along over the open ocean to breeding grounds hundreds of miles away. Practical experiments with other birds have also proved their possession of this mysterious power of direction. The Florida Keys are the most northerly breeding grounds of the Noddy and Sooty Tern. Fifteen marked birds of these two migrant species were taken from their nesting haunts on one of these Keys and placed on board a steamer. They were then released at distances varying from 20 to 850 miles away. Some of them were set free off Cape Hatteras, many degrees northward of their usual range. Thirteen out of fifteen found their way home.

It is also fairly obvious that in the course of long flights, which may extend to over a thousand miles, many birds must frequently be blown by contrary winds far out of their direct route, so that, if they had not this sense of direction, few would ever reach their destination.

But this sense, as might be expected, is by no means infallible, and birds often stray. No doubt the majority of these strays come to a tragic end, but some find unaccustomed havens, and account for the irregular appearance of many species far away from their usual haunts. Some of these waifs may owe their salvation to falling in with a train of another species using a different route. This explanation has been

ingeniously used to account for the fairly constant appearance of odd specimens of North American species in Great Britain. It is pointed out that a certain number of these species breed in Greenland, not far away from species which migrate south-east to Europe, instead of south-west to America. An American bird straying slightly might fall in with voyagers taking the European route and follow in their wake to Great Britain instead of taking its proper course.

There is no doubt that the perils of the journey are many, and take a heavy toll of the migrating hosts. A bird may start from Ushant with a fair wind and encounter a gale before Scilly or the Eddystone is reached. Fog is another source of danger, especially when there are lighthouses near. When the nights are clear, the light does not exercise so great an attraction, but in haze, drizzle, or fog it seems to act in a mesmeric manner and lures thousands of birds to death. They dash at the lantern, strike the glass, fall stunned or with broken wings, and so perish.

Weather, in fact, has a most important bearing on migration. Migrants have in the main a fairly regular time table. Most of the English summer visitors, for instance, start south before the necessities of inclement weather and a failing food supply drive them away, but an unusual warm spell in autumn may make birds put off their departure or linger *en route*, while a sudden cold snap will hasten their going. The great thing to remember is that it is the weather at the point of departure which influences them, especially at the start of a long overseas journey. The *direction* of the wind does not seem to have a great influence, provided it is not too strong, but boisterous weather holds migrants up. Most of the wholesale destruction which at times overtakes migrating flocks is due to their suddenly meeting with unfavourable weather after they have once committed themselves to an extended flight.

In the light of these main facts concerning migration in general, we may now consider the special conditions applying to migration in Ceylon. I am afraid that in this part of my paper many of my remarks have to rest on inference and analogy. Little detailed observation on the subject has been done in the Island, nor can I find much on record regarding the

neighbouring continent of India. We know pretty accurately what species are migrant, together with their summer and winter quarters, but details of the routes and times have not been thoroughly worked out. As a matter of fact, Ceylon lacks many of the advantages possessed by the British Isles as a centre for the study of the subject.

It does not lie athwart the main thoroughfares of migration, while in the tropics the proportion of migrant birds is fewer. Above all, we lack the incomparable observation stations which surround the British Isles in abundance. To quote Mr. Eagle Clarke once more :* " In connection with the geographical aspect of migration, it is impossible to over-estimate the value of observations made at islands, *i.e.*, small islands, and rock stations, and other places removed from the usual haunts resorted to by the various species. At such stations to see certain birds is to know at once that they are migrating, for under no other conditions would these particular species be found there. The most unsatisfactory of all observations are those made inland. Here individuals of many species moving to other quarters are most difficult, if not impossible, to distinguish from the native representatives of the same species. In addition, the area, and in many cases the cover, is so extensive that few, very few, of the birds passing through any district come under notice. One never knows what is in the next field or the next bit of cover, while woods are hopeless, it being impossible to ascertain the smaller migrants which are nesting in them."

The few lighthouses in Ceylon, with the exception of Colombo, lie away from the main routes of migration ; Colombo lighthouse is in the middle of the town, and does not seem to attract any remarkable number of birds. The open grassy extents on the Galle Face, the racecourse, and the golf links are among the best stations obtainable. Probably a good deal might be done on some of the islands between Mannar and Point Pedro, but Ceylon will never be a paradise for the recorder of general migratory movements, though, as I shall show later, in one or two respects our opportunities are unique.

* "Studies in Bird Migration," Vol. I., Chap IV.

To realize the position occupied by Ceylon in the general flow of migration, one should glance at the map of Asia. The bulk of the migrant species which are summer residents in Northern and Central Europe winter in Africa. The desert of the Sahara is the "No man's land," which lies between the summer and winter quarters of many a species. In Asia a more or less corresponding position is occupied by the Himalayas and the great elevated plateaux of Central Asia. Countless hosts which breed on the Siberian Tundras winter in Tropical Asia. There can be no doubt that many Siberian birds move south-eastwards down through the Malay Archipelago to Australasia, or south-westwards down the Arabian Coast to East Africa; but for those that cross the Himalayas and strike southwards through India, Ceylon lies at the end of the route.

Accordingly, instead of being a busy junction like the British Isles, Ceylon is a terminus reached by comparatively few. It is possible, but unlikely, that a certain number of migrants may strike off from our shores south-west to Mauritius and Madagascar or south-east to the Malay Archipelago; but in each case the sea voyage is so long, and these countries may be reached by so much easier routes, that in all probability we may say we have practically no birds of passage. Again, as we are almost on the Equator, we have no summer residents, that is, as far as I know, we have no migrants which come to us for their breeding season. Our Island is wholly a winter resort. Our stragglers, too, are comparatively few in number, and are composed, not so much of birds which have wandered off their true line of migration, as of stray specimens of species which usually winter a little to the north of us, but which have pushed on beyond their accustomed range. We must also remember that being in the tropics the proportion of resident species is larger than it would be in a temperate climate. The migratory movements, therefore, in Ceylon are not nearly so complex as in England.

The total number of species at present recorded from Ceylon is roughly 375; of these, about 15 are very doubtful inclusions, leaving about 360 genuine species on the list. Of these 360 species, two-thirds are known, or are reasonably believed, to

breed with us, leaving about 120 species to be accounted for between the regular migrants and the stragglers. The above figures are rough calculations based on our present knowledge, which is in many cases by no means perfect. So much work remains to be done with regard to the oology and distribution of our birds that the figures may need some revision when our information is more complete.

Now these 240 species which breed in Ceylon may be either wholly "permanent residents" or "partial migrants." "Partial migrants" are those species in which some individuals reside with us all the year round, while others migrate usually to regions not very far away. Our knowledge of local seasonal movements is so incomplete that in many cases it is extremely hard to say with any certainty whether a species is wholly resident or only partly so.

On the one hand, we know that in the tropics birds are much less given to wander than in temperate climates. This is forcibly illustrated by the much greater part borne by geographical isolation in the evolution of peculiar species in Ceylon as compared with the British Isles. In Britain there is only one well-defined species peculiar to the country—the Red Grouse, *Lagopus scoticus*—though it has been ascertained, largely as the result of studies in migration, that there are various insular races, or resident sub-species, even among the partial migrants. In Ceylon, which lies about as near to India as England lies to the Continent of Europe, we have over 40 peculiar species. Legge mentions 47 such, but one or two of these—e.g., Legge's Hawk Eagle, *Spizætus kelaarti*—have since been discovered in South India, and several others might now be classed as only sub-species. The number of insular races or sub-species is probably very high. Mr. Stuart Baker, who has been working out the races and sub-species of a good many Indian birds, tells me that, in his opinion, two out of every three of our residents will turn out to be more or less sub-specifically distinct.

On the other hand, we know that, as a rule, in the case of partial migrants, the migrant individuals do not make a very extended journey, and India does not lie far away. It is very obvious to any one who is acquainted with the birds of

any locality in Ceylon that there is a good deal of seasonal movement, especially among such birds as the smaller species of Heron, the Lark family, the Rails, and some of our Hawks. We have still to ascertain whether numbers of these birds move merely to other parts of the Island during the breeding season, or leave our shores for South India.

It is definitely known that some species—for example, the Ashy Finch Lark, *Pyrrhuloxia grisea*, and the Pariah Kite, *Milvus govinda*—which have only a local distribution in Ceylon, are largely reinforced during the north-east monsoon by migrants from India. I have heard Whistling Teal passing over Colombo at night and coming probably from South India.

We have also a small, but very interesting, group of partial migrants, which includes the Kentish Plover (*Argalitis alexandrina*), several other species of Waders, and one or two of our Terns. The birds of these species which breed with us are really resident races of northern migrants, and their permanent abode in our Island is probably due to the gradual breaking down of the migratory habit. I shall revert to this group later on.

To sum up. Our knowledge of the partial migrants is very imperfect, and while in Ceylon this group undoubtedly includes a far smaller proportion of the bird population than in temperate climates, probably a good deal of partial migration passes unsuspected.

We now turn to a group of non-resident species: the stragglers and casual visitors. It is very difficult to draw at any one point a hard and fast line of demarcation for these two classes. There are about 60 species on the Ceylon list which visit us at very infrequent intervals, or which have been recorded less than half a dozen times. Some of these are genuine waifs, such as the Lesser Scavenger Vulture, *Neophron ginginianus*, of which a stray specimen, probably storm-driven from South India, was once obtained at Nuwara Eliya. Then there are the ocean wanderers, such as the Frigate Birds, Tropic Birds, Boobies, several species of Tern, and so on. These turn up at odd intervals, generally after stormy weather, and can hardly be classed as seasonal migrants.

Again, how are we to class Jerdon's Imperial Pigeon, *Ducula insignis cuprea*, which occurs all over South India ? It has only once been recorded from Ceylon, but was on that one occasion found breeding.

However, at least half of our casual visitors are species which perform regular migrations, but whose usual winter quarters do not extend so far south as our Island. Nearly all the members of this class belong to families which include our common winter visitors. If we look at the 12 species of duck which occur in Ceylon, the gradation is well seen. The Smaller Whistling Teal, the Quacky Duck or Goose Teal, and the Comb Duck are resident, but also in all probability partial migrants ; the remainder are all migrants, which visit us in varying numbers. The Common Teal and Garganey are fairly abundant in some years, but scarce in others. The Brahminy Duck and the Shoveller visit the lagoons in the north of the Island in small numbers, which vary from year to year. The same may be said of the Spotted-billed Duck and the Pintail. Two more species, the Larger Whistling Teal and the Gadwall, have only been recorded once or twice, and should, therefore, be put down as casual visitors, while the Red-crested Pochard is on the doubtful list ; it is said to have been seen near Jaffna by Layard.

We have now arrived by the process of elimination at our regular migrants. These vary from birds which visit us every year in enormous quantities, such as the Pintail Snipe, to species which are extremely scarce, but fairly regular in their visits, such as the Woodcock. At the lower end of the scale, as I have said, it is difficult to draw the line between them and the casual visitors. We may, however, say roughly that the regular migrants number between 60 and 70 species, all of which visit us during the north-east monsoon.

The number of species is thus only just over one-sixth of those on the Ceylon list, but the number of individuals is so large that the bird population is swelled enormously by their arrival. This is especially the case on our lagoons, paddy fields, and tanks, which teem with bird life during the north-east monsoon, and present a comparatively deserted appearance during the south-west. In fact, in Ceylon we have the

converse of the conditions obtaining in the far north of Asia. From about October to April, at a time when Siberia is frozen out, there are vast areas all over the "dry zone" of the Island which are swamped by the heavy monsoon rains, and afford abundant sustenance for the hordes of Waders and aquatic birds which visit us. From April to October these mud flats and paddy fields are parched and dry, and many of the tanks have shrunk to mere puddles. The aquatic and semi-aquatic migrants would have a meagre time if they all stayed on.

From what regions do our migrants arrive? The Passerine migrants, which are most strongly represented by the Warblers, Shrikes, Flycatchers, Thrushes, and Wagtails, mostly come from North India. The same may be said of the Cuckoos. Most of the migrant Hawks and Waders come from further afield, from temperate or Northern Asia.

I have noted earlier that the Himalayas in a great measure form the dividing line between the winter and summer quarters of the Asiatic migrants, just as the Sahara does for those of Europe and Africa. There is this difference though: on the southern slopes of the Himalayas we have an extensive regional belt of elevated land with temperate conditions of climate, and many birds find a congenial breeding ground there without continuing their course further north. It is no wonder, therefore, that many of the more delicately formed Passerine migrants settle down to breed in large numbers in Cashmere and other Himalayan districts, which are well suited for them, while the stronger-winged Harriers, Falcons, and Waders carry on to the enormous breeding grounds in the marshes of Siberia. This distinction, however, is by no means universal. Some Swallows and other Passerine species breed on the north as well as on the south side of the great ranges. The Forest Wagtail—*Limonidromus indicus*—retreats to Northern China and Eastern Siberia, and so on, while some of the Kestrels and Woodcocks breed on the Himalayas.

It is quite possible, though in the present state of our knowledge it would be unwise to be dogmatic, that the axiom that those birds which breed furthest north winter furthest south holds good to a certain extent, in which case our Ceylon

birds would seek the northernmost confines of their breeding area. The same axiom may hold good when we come to examine the range of several species, which, though wholly migratory as far as Ceylon is concerned, are only partial migrants in India, for example, the Indian Pitta—*Pitta brachyura*. This species ranges practically all over India. In summer it is found in Northern India ; in winter in Southern India and Ceylon ; in a good many parts of Central India it is a permanent resident. Very possibly it is the South Indian and Ceylon birds which migrate to Northern India. It is equally possible that in Central India the seasonal movements of this species may be as complex as those of the Thrush in England.

Another general axiom that migrants wander a good deal more in winter than at the breeding season has considerable bearing on the ebb and flow of our migrant population, and accounts for many of our irregular migrants. There is no doubt that the Snipe, Golden Plover, and many more of the Waders which visit us in such hosts are more abundant in some years than in others. The difference may to some extent be accounted for by favourable or unfavourable conditions on the breeding grounds, resulting in a stronger or weaker tide of migration from the far north. On the other hand, the difference in number seems to be affected rather by a favourable or unfavourable season in Ceylon. Our winter visitors do not arrive from Siberia in one long flight. Once they have crossed the Himalayas, they probably filter gradually down through India, and if they do not find conditions suitable as they proceed south, they do not penetrate in their usual numbers as far as Ceylon.

There is no doubt that many birds linger some time on the way. Let us take a typical Wader. The Pintailed Snipe breeds in Northern Siberia, from the Yenesei to the Pacific, and the birds must leave such a cold region fairly early. The vanguard arrives in Ceylon on the south-west coast of the Island about the beginning of September. In the north and east of the Island, where the rains do not render the country suitable for them until far later, the birds do not appear in great numbers until well on towards Christmas. These later arrivals

must have journeyed down gradually and lingered on the way, knowing that it was useless for them to arrive here before the conditions were favourable.

This leads us on to a discussion of the routes by which our migrants in general arrive and spread over the Island, and also of the times of their arrival and departure.

Our knowledge of the particular routes used by the various species leaves much to be desired, but there are fair general indications. We have seen that coast lines and large river valleys are favourite fly lines, so it is probable that most of our migrants come to us down the Indian Peninsula either by the east coast or west coast routes. Birds from Eastern Siberia, Mongolia, and the Chinese Empire would come chiefly by the former fly line; birds from Turkestan and Western Siberia by the latter.

We have a very good example of a species which uses the east coast routes in the Pintailed Snipe, which, as I have mentioned, breeds in Siberia from the Yenesei eastwards to the Pacific. During the winter it is very rare in the Punjab and North-west Provinces, commoner as one passes east to the Ganges delta, while it is the Snipe of Southern India, Ceylon, Assam, and further India. It is fairly obvious, then, that this species finds its way into India mainly from the north-east. Probably its main line of migration lies down the valley of the Brahmaputra, and divides when the delta is reached, one branch going south-east to Burma, the other south-west down the western sides of the Bay of Bengal. There may be other crossings over the Eastern Himalayas, in which case the birds would make their way to the coast down the Ganges valley. Migrant species in general coming from Nepal and the Eastern Himalayas would follow this latter fly line.

There can be little doubt that species, such as the Little Stint (*Tringa minuta*) come to us mainly by the west coast. This Stint breeds in Northern Europe and Siberia, and in winter is not found east of the Bay of Bengal. Individuals from the neighbourhood of the Urals may possibly come southwards to the Caspian, then across country to the Persian Gulf, and right along the coast line of India to Cape Comorin.

Others, again, from further east may cross the Western Himalayas and come down the Indus. The Indus valley and west coast fly line would also serve many of our visitors from the Western Himalayas as far east as Cashmere.

Some species may come to us by both routes. The Large Sand Plover (*Ægialitis geoffroyi*) breeds in Japan and Eastern China. In winter it is a shore bird, found all along the coasts of the Indian Ocean, from Australia to Africa. Birds proceeding to western winter quarters probably cross over the mountain ranges from Thibet and so down the Indus valley. On arrival at the mouth of the Indus birds going to Africa would cross to the Arabian coast, others would turn south-east down the west coast of India. More easterly migrants would come down the Brahmaputra and the east coast of India. These two routes would meet in Southern India, so that Ceylon birds may arrive from either direction.

Again, some migrants, especially hill species, may come overland most of the way south, keeping down the line of the Ghauts.

As regards the actual crossing from India to Ceylon and *vice versa*, we have a good many indications to show that there are two main routes : one which strikes the shore at or near Colombo, and the other into the north of the Island along the belt of shallows from Point Pedro to Mannar. There is no doubt that a good many of our migrants use the Colombo route. Exhausted specimens of such species as the Indian Pitta (*Pitta brachyura*) and the Banded Crake (*Rallina eurizonoides*) are found from time to time at the beginning of the north-east monsoon in Colombo gardens. They are generally in a very exhausted state, and have evidently just landed. Again, the earliest Snipe of the season are usually obtained in the Western Province, while the Blue-tailed Bee-eater (*Merops philippinus*) appears in the south-west as soon as in other parts of the Island. As a matter of fact, Colombo is just the place where one might expect the arrival of the Indian west coast route migrants, which would take off at Cape Comorin ; but the early presence of the Pintailed Snipe would seem to show that it is not confined to such birds, unless it be that the early Snipe cross over to

the western side of the peninsula before Cape Comorin is reached. Probably, too, many of our hill migrants arrive by this route, as it affords them a more direct journey, and avoids the long stretch of unsuitable country in South-eastern India and North Ceylon.

The evidence that a large number of birds reach us *viâ* the north of the Island is equally satisfactory. This route would appear to feed especially the north-west, north, and east of the Island. Many of our lagoon-haunting species are found on the north-west coast as far south as Chilaw, and all down the east coast as far round as the Tangalla district, while between Chilaw and Tangalla they are rarer or absent. There are a good many such species, *c.g.*, the Little Green Shank (*Tobanus stagnatilis*), the Whimbrel (*Numenius phæopus*), the Red Shank (*Totanus calidris*), and the Green Shank (*T. glottis*).

Again, the Wood Wagtail (*Limonidromus indicus*) is extremely common round Puttalam during the north-east monsoon, and spreads across through the forests in the north of the Island. It is very rare further south.

To this evidence we must add that some common species, such as the Swallow and the Eastern Golden Plover, appear in the north of the Island just as soon as in Colombo. Mr. Hartley tells me that the Golden Plover is generally seen by him on the Royal College grounds very early in September. This year they appeared on the 2nd. I once saw a flock at Mannar on August 30.

There is one species which seems to give a very striking proof that these two routes are the main fly lines. The Indian Ashy Drongo (*Dicrurus longicaudatus*) is with us a migrant found chiefly in the forests of the north and east of the Island. It has been seen at the beginning of the north-east monsoon at Jaffna and Trincomalee, and also at Colombo, but apparently at no other points on the coast.

There are also traces of cross-country migration between the south-east or east and the west or north-west. On April 22 of this year, for instance, Mr. Roberts of Kotiyagalla, Bogawantalawa, shot a Black Bittern (*Dupetor flavicollis*) in

that district. It must have been migrating from somewhere in the low-country of the south or south-east to Colombo or the north-west.

The times of arrival and departure of our migrants varies to a certain extent, some species putting in their appearance earlier than others ; many species begin to arrive in September, and the tide of migration has set in strongly by the end of that month ; but, as we have seen, many birds, especially the Fresh-water Waders, do not arrive in the north of the Island until later. April appears to be the month in which most depart, and by May 1 the bulk of them have gone. Some species, probably those which migrate slowly and linger on the way, seem to arrive later and leave earlier. This is the case with such hill birds as *Hierococcyx varius*—the Common Hawk Cuckoo—and the Woodcock, which do not come in much before November and depart about February.

Other species, such as the two small Sandpipers—*Totanus glareola* and *T. hypoleucus*—usually known as Snippets, often come in considerable quantities quite early in August. Now these particular species do not generally leave us till April, and they breed north of the Himalayas, where the country cannot be ready for them until well on in May ; so that birds which arrive early in August can scarcely have had time to get to the breeding grounds and stay there long enough to bring up a family before their return. We know, however, that many individual Waders do not breed at the end of their first year. Some of these on arrival in their summer quarters play about for a few weeks and then turn south earlier than the nesting birds. Some, again, only perform part of the journey ; for instance, in England numbers of Turnstones and other species, which are solely “birds of passage” breeding further north and wintering further south, spend the summer as non-nesting birds. So birds which arrive in Ceylon from the far north early in August are most certainly those which have not been breeding.

This habit of loitering is carried even further. In some species a certain number of birds never start on their northward journey, but remain in their winter quarters throughout the breeding season.

You may find little groups of such birds in suitable places on the Ceylon lagoons during the south-west monsoon, and it is important to note that the great majority of such birds have not changed into breeding plumage. This fact strengthens the evidence for the theory that it is the breeding impulse which calls migrants north in the spring. Birds which for some reason or other have not developed full maturity do not feel the impulse to such a degree, and so some of them remain with us.

This habit of loitering has been known for some time, but no one seems to have studied it with great thoroughness, probably because most of the work on migration has been carried out in temperate climates, where loiterers do not attract so much attention. I think it is a subject which will well repay investigation, and here in Ceylon we have an ideal opportunity for its study.

It is at the southern limits of the migration routes that the question of actual loitering of migrants in their winter quarters can best be investigated. Then there is no disturbing factor introduced by birds of passage. Where such a southern limit lies far south of the Equator, as in South Africa, much loitering is not likely to take place. The approach of the southern winter would drive north those birds which might otherwise be inclined to stay. In our case we are at the very end of a migration route, and in the tropics, with an equable climate, a combination of conditions which affords the fullest temptation for birds to linger.

It appears to me that in loitering we may see the intermediate steps by which all along the tropics new resident species are being evolved from northern forms by the gradual breaking down of the migratory habit among a proportion of the birds of any species. When birds once take to loitering, they find that life in the tropics is possible all the year round, and so in process of time may slowly be induced to overcome the deeply ingrained instinct which impels them to migrate northward for the purpose of breeding. In some cases, from whatever reason, this evolution has already taken place, and accounts for the interesting group of our "partial migrants," to which I have already alluded.

The most noticeable instances are among the Hawks and Plovers. The Shaheen Falcon, resident in India and Ceylon, and, similarly, the Indian Hobby, differ almost solely by their smaller size and darker colouring from closely allied migrant species, which breed in the north and visit the tropics in winter. Herein they follow the general rule, exemplified again and again in Indian Ornithology, that where species are found over a wide range of latitude, birds bred in the south of that range are smaller and darker than those from the north.

Two migratory species of the genus *Ægialitis*—*Æ. alexandrina* (the Eastern Kentish Plover), and *Æ. dubia* (the Little Ringed Plover) have also produced resident tropical races, which breed in Ceylon. Each of these resident Plovers is a little smaller and darker than the allied migrant form from further north, which visits us during the winter in considerable numbers. Again, *Himantopus candidus* (the Black-winged Stilt) is a Ploverine species, in which a very large proportion of our Ceylon birds are resident ; whereas over the greater part of India the species is migrant, and appears to visit breeding grounds in Central Asia. There are, however, well-known nesting localities in several parts of India.

Now, if there is any truth in my theory, we should find every gradation between species with resident tropical forms and those in which there is little or no loitering. If we take a census of Ceylon loiterers, this does seem to be more or less the case ; and further, loitering seems to be commonest among those species for which our Island affords the most suitable summer conditions, and consequently the greatest temptation to loiter.

The "Fresh-water Waders," of which the commonest are the Pintailed Snipe and the Snippet (*Totanus glareola*), do not appear to linger much in the Island. By Easter the paddy fields, which are their main haunts, have been reaped, and in the dry districts are parching up, so there is no great inducement for them to stay. There is no doubt that loitering Snipe are occasionally seen, and in one or two instances have nested in Ceylon. Very probably these are birds which have received some slight injury from a stray pellet during the shooting season, and so have been incapacitated from making

the long journey north. Also in some cases confusion has arisen from inexperienced persons failing to distinguish between the Painted Snipe, which is a resident species, and the migrant Pintail Snipe. The loitering records for this species are thus not very trustworthy.

Loiterers are more common among the "Salt-mud Waders." In the mangrove swamps and on the adjoining shores of the lagoons in the Puttalam District I have seen from May to July quite a number of Whimbrel and Curlew Stints and a few Redshanks and Little Stints. Most of these birds are not in breeding plumage, but some bear traces of their summer dress. On the big brackish lagoon at Hatagala, in the Tangalla district, I have at the same time of year come across the Greenshank and the Little Greenshank. I have never yet, however, discovered any traces of breeding among birds of these species.

The loiterers are most numerous among our Sand Plovers, and it is in this sub-family that we get the most distinct signs of the evolution of resident forms. As we have seen, the Eastern Kentish Plover and the Little Ringed Plover have already reached the resident stage. The Lesser Sand Plover (*Æ. mongolica*) is found in comparative abundance during the south-west monsoon, and an equal proportion of the relatively scarcer Large Sand Plover (*Æ. geoffroyi*) remain. Most of these, again, are in winter plumage, but a few are in full summer dress, and some are halfway towards it.

I have once or twice seen the Lesser Sand Plover in pairs late in May, though I have never found the eggs. The Eastern Golden Plover (*Charadrius fulvus*) for some reason does not appear to loiter much, though Mr. Parker seems to have discovered traces of birds laying eggs in Ceylon.*

It is also interesting to note that there have been sporadic instances where migrants which do not usually loiter have nested in the Island. There seem to be fairly authentic records of such nesting on the part of the White Stork† and the Shoveller Duck.‡

* Legge: "Birds of Ceylon," p. 1222; and "Stray Feathers," Vol. IX., p. 482.

† "Stray Feathers," Vol. IX., p. 485.

‡ Legge: "Birds of Ceylon," p. 1088.

I do not by any means pretend that I have proved my theory conclusively, but the facts I have stated seem to indicate its possibility. Our knowledge of the subject is as yet very imperfect. In other problems of migration we have for guidance a great mass of carefully sifted evidence based on work in other parts of the world; but here is a point which seems to have been comparatively unnoticed, and in which reliable evidence would be of great value. Such reliable evidence requires a large series of accurate observations and a patient examination of the records obtained. It is one more instance of the vast field of work in our Ornithology which still awaits investigation.

A NOTE ON SUANA CONCOLOR (WALKER).

By RONALD SENIOR-WHITE, F.E.S.

(With one Plate.)

Position.—Lepidoptera, Heterocera. Family Lasiocampidæ.

Distribution.—Throughout India and Ceylon; Philippines; Java (Hampson).

Food Plants.—*Psidium guyava*; *Cajanus indicus*; *Hibiscus rosa-sinensis*; "Daminiya" (Sin.) = ? *Grewia tiliaefolia*. Lefroy gives *Shorea robusta* as the food plant, whilst Beeson (Ag. Jo. Ind. 1918) mentions it as a definite pest of this tree. It probably occurs locally on other plants, but such have not come under my notice. It is said to occasionally attack tea in Ceylon.

Occurrence.—There are in this district two broods per annum, maturing in February-March and September, respectively.

Egg.—Barrel-shaped, height 2 mm., diameter $1\frac{1}{2}$ mm. Upper end brown, micropyle black, lower end all white. There is a brown patch on each side apparently at point of contact with adjacent two eggs. A few eggs are pale green, and not white. Eggs laid in plates around a branch strongly cemented together. A few eggs are found on the ground beneath, mixed with male anal hairs, being apparently those first laid. A female I had under observation laid 611 eggs in one night, and contained on dissection 50 more developed eggs.

Larva.—The young larvæ on hatching make their first meal off the shell, and take no other food for two days. Length when hatched 7 mm. Head black, body ringed black and white, with a yellow patch on the black meta-thoracic band. There are long soft hairs, those from the thorax directed

upwards and outwards. There are no urticating hairs at this stage. The length increases to 13 mm. before changing. The cast skin is not eaten. When very young the larvæ web the food plant, but only for the first few days of larval life. After the first skin change, the appearance of the larvæ is unchanged as regards the thorax, save that the yellow patch is not so broad, but abdominally dorsally there is a broad bluish band with darker striæ. Dorsally on the eighth abdominal segment a black cushion with white tips to hairs. The black and white bands remain laterally. Thoracic lateral hairs white and thick, abdomen up to eighth segment almost naked. The meso- and meta-thoracic bands of black urticating hairs develop in this instar. These are situated in folds on the upper surface of these segments, and are erectile when disturbed. Towards the end of the instar the white abdominal bands turn yellowish, and are indistinguishable. Head blue-gray, with longitudinal black striæ. The length before the next change is 30 mm. After this change the abdomen becomes entirely bluish, irrorated with yellow. As the instar progresses, the yellow predominates over the blue, till laterally the abdomen is all yellow with darker striations. There is an oblique white bar on the meta-thorax—first abdominal segments. Length before next change 50 mm. The next is normally the last larval instar. Colour uniformly pale gray-brown with darker striæ all over. On meso- and meta-thorax are fan-shaped tufts of black erectile very urticating hairs, barbed, which, if they enter the skin, set up severe irritation, which persists for 48 hours or more. On the eighth abdominal segment dorsally is a dark hair cushion. On each segment sub-infra-spiracularly are downly-directed gray hairs, with some, shorter, whitely spatulate. The hairs at the extremities are anteriorly and posteriorly directed, those on the thorax make tufts, not pencils. There are five pairs of prolegs, the anal pair spread sideways and nearly hidden in hair. Head brownish, with four vertical lines on the occiput, the two central ones shorter, basal joint of antennæ and clypeus white. All legs brown. The ventral colour is pink with median orange bar, and black bands to segments. Length, full grown: male 75 mm., female 140 mm., though bred

larvæ of this sex do not exceed 120 mm. The larval sex is indistinguishable by size until the last instar is approaching completion.

Pupa.—After 7 days as a pre-pupa this is formed within a very tough cocoon of grayish silk interwoven at each end with the urticating thoracic hairs. The pupa itself is dark brown with three yellow rings abdominally. Length, male 26–30 mm., female 50 mm. The cocoon is softened by a fluid prior to the emergence of the imago.

Imago.—Male: Fore-wings dark red-brown, some pale yellowish suffusion along costal margin, and some lighter scales along the course of the veins. The hind-wings are dark brown. Thorax red-brown, abdomen dark brown, with long anal tuft of very dark brown hairs. Antennæ bipectinate, very broadly on the basal half. Expanse 48–60 mm.

Imago.—Female: Fore-wings a paler red-brown, the basal area slightly darker, and a slightly darker indefinite broad band across the middle of the wing, with some darker colouration from outside this bar below costa to apex broadly. Near outer edge of sub-basal dark area is a prominent white lunule. The hind-wings are pale brown. The thorax and abdomen coloured as fore- and hind-wings respectively. Antennæ minutely pectinate. Expanse 106 mm.

Life Cycle.—Egg 14 days. Larva 12–16 + 21–24 + 25 + 58–78. In all 119–140 days. Pupa: (male) 29–33 days; (female) 24 days. Total 162–178 days. These figures apply to the brood maturing in February, but the September brood probably is of very similar duration.

Hampson describes a variety or “? younger stage” of the larva with small white-haired dorsal papillæ on segments 4 to 10, each with a pair of red-brown papillæ in front and a pair of crimson papillæ on each side. In all the larvæ that I have bred I have never seen this form occur.

The female has a very strong attraction for the male. If a female be placed out at dusk, I have never failed to attract a male within a few minutes between the hours of 6.30 and 6.45 P.M., though the insect is by no means abundant here. Copulation commences at once, and egg laying is completed by morning.

If both sexes emerge on the same evening in the breeding cage, they couple as soon as the wings harden, though in the one case on which this occurred with me the pair were still in copulation at 7 A.M. next morning. In copulation the male alights on the back of the female, after flying round her for from only a few seconds to 5 minutes, and then, conjoining the abdominal apices, the male hangs below the female, which supports the weight of both, in the usual *Lasiocampid* attitude of a fallen leaf, the stalk of which is made by the palpi.

With one brood which I carried through from the egg there were two larvæ, which did a fourth change (5 larval instars), and lived for 47 days after the last change, then dying without any visible cause or attempt to pupate.

Control.—The larvæ are attacked at all stages by a fungus, which has been identified by the Government Mycologist as *Verticillium* sp., a *Penicillium* being also found on a dead larva kept for some time, which Mr. Petch considers as being probably secondary. The attack of the *Verticillium* is rapid, larvæ being suddenly found covered with the matted white hyphæ of the fungus. A Phorid with a pupal period of about 16 days was also found in suspicious circumstances emerging from dead larvæ which had turned a dark brown prior to death, though there was no visible fungus attack. These had been placed in test tubes closed with a cotton wool plug when almost dead, and though it is not proved that the Phorid will parasitize healthy larvæ, I think I am correct in stating that it will certainly oviposit in larvæ before death from some other cause. Specimens of this fly have been sent out for identification, but this has not yet been done.

EXPLANATION OF PLATE.

Suana concolor.

Fig. 1.—Larva, first instar. $\times \frac{1}{2}$.

Fig. 2.—Larva, second instar. $\times \frac{1}{3}$

Fig. 3.—Larva, third instar. $\times \frac{1}{3}$

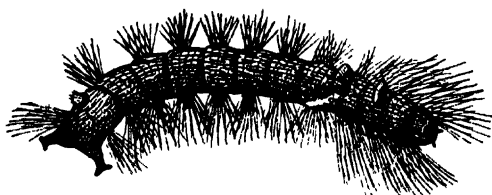
Fig. 4.—Imago ♂. $\times 1$

Fig. 5.—Pupa ♂. $\times \frac{1}{3}$.

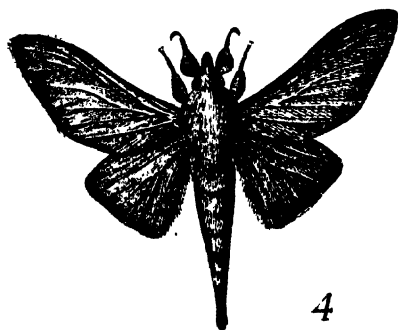
Fig. 6.—Larva, fourth instar. $\times 1$.



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BUANA CONCOLOR

A NOTE ON *KOGIA BREVICEPS*.

By JOSEPH PEARSON.

(With four Plates.)

A SPECIMEN of *Kogia breviceps* (de Blainville), the Pygmy Sperm Whale, was washed ashore at Moratuwa on the western coast of Ceylon on November 30, 1915, and the carcase was presented to the Colombo Museum by Mr. J. B. N. Jayasinhe. The specimen was stuffed, but the skin deteriorated very rapidly owing to the difficulty of removing the fat and oil. Finally, it was decided to make a papier-maché cast, and this has proved a complete success, and is now exhibited in the Mammalian Gallery of the Colombo Museum, together with a complete skeleton. Although the skull and other parts of the skeleton are fairly well known, I do not know of any other Museum in which there is a cast of the soft parts.

The synonymy of *Kogia breviceps* is somewhat complicated, and it has been described under the following names:—*Physeter breviceps* de Blainville, 1838; *Euphysetes grayii* Wall, 1851; *Euphysetes simus* Owen, 1869; *Euphysetes macleayi* Krefft, 1865; *Kogia floweri* Gill, 1871; *Euphysetes pottsi* Haast, 1874; *Cogia breviceps* Benham, 1901. Also *Kogia breviceps*, *K. grayii*, *K. simus*, *K. macleayi*, and *K. pottsi* by various authors.

It is now generally agreed that there is only one species, though there appears to be a good deal of variation within the species regarding the proportions of the cranial bones, the absence or presence of teeth on the upper jaw, the number of ribs, the vertebral formula, and the phalangeal formula.

The following notes refer to the Ceylon specimen :—

Colour.

Jet black above and at the sides, the belly being pinkish in colour. The two colours do not merge into one another at the sides, but are clearly separated.

Measurements.

Total length from tip of snout to tip of tail	..	255 cm.
From tip of snout to tip of dorsal fin	..	129 cm.
Height of dorsal fin	..	19 cm.
Length of flapper	..	33 cm
Distance from front of eye to tip of snout	..	23 cm.
Depth of body just in front of dorsal fin	..	53 cm.
Girth of the same place	..	145 cm.
Girth halfway between dorsal fin and base of tail		72 cm.
Extreme horizontal distance between the two flukes of the tail	..	56 cm.

The vertebral formula of the specimen under examination is C7, D13, L9, Ca24. The 25th caudal vertebra is absent, but I am satisfied that it has been lost in the preparing of the skeleton. There are only fifteen hæmal arches, the small posterior vertebræ apparently not having any, though it is possible that some of these may have been lost in preparing the skeleton owing to their small size.

There are thirteen ribs, the anterior eight alone having both capitulum and tuberculum. Each rib consists of a single bone, from the ventral end of which is a cartilaginous extension, with the possible exception of the last pair, which are exceedingly short.

The sternum consists of three parts, the presternum being the largest, and having a deep cleft in its anterior border. The first pair of ribs articulate with lateral expansions of the presternum. The second pair of ribs joins the sternum between the presternum and mesosternum, and the third pair between the mesosternum and xiphisternum. The cartilaginous extensions of the fourth and fifth ribs unite and join the posterior part of the xiphisternum. The last eight ribs are not joined to the sternum.

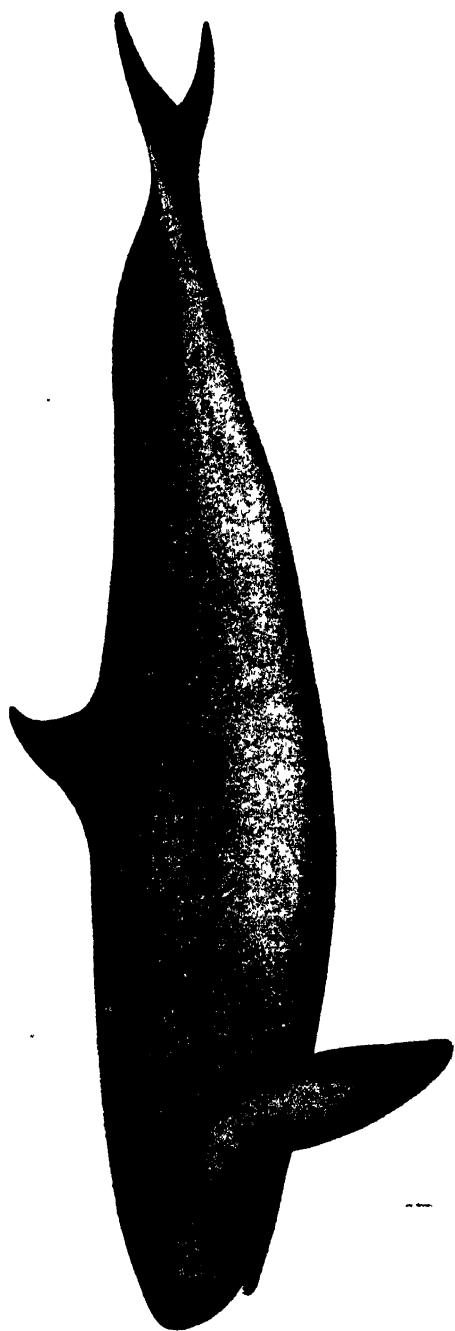
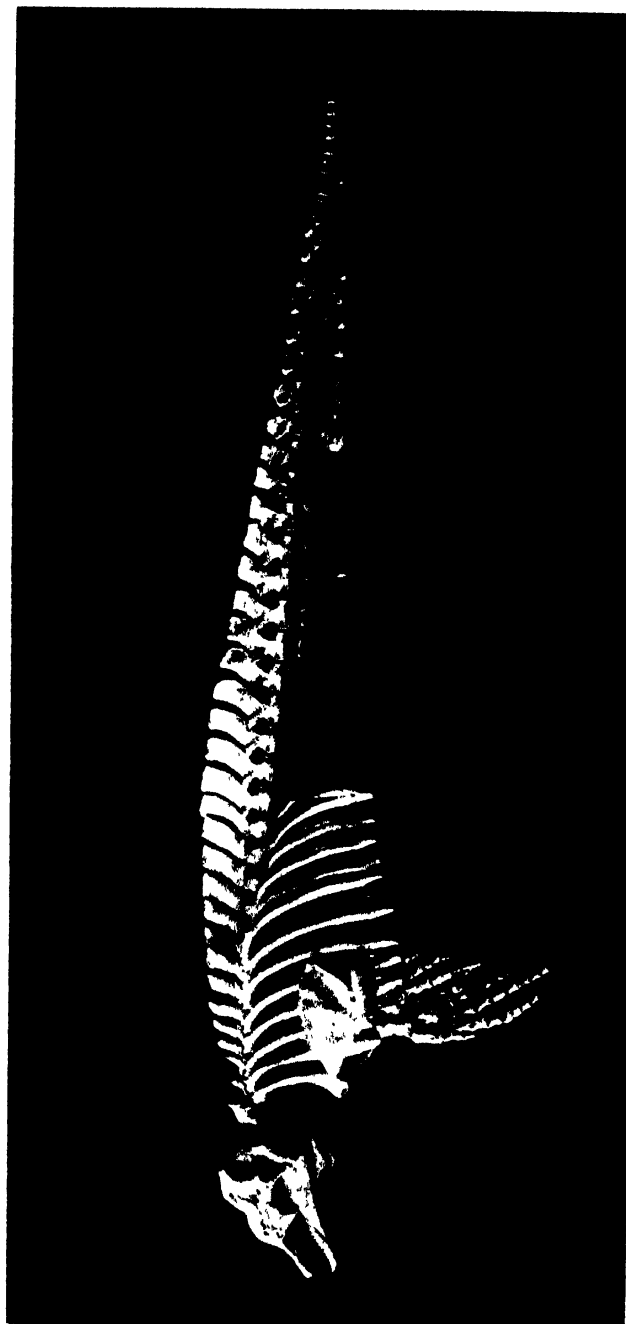


Plate II.



KOGIA BREVICEPS.



KOGIA BREVICORN



KOGIA BREVICEPS

The phalangeal formula differs from the general arrangement usual in the species, but this may be due to small bones having been lost in mounting. The formula of the Ceylon specimen is I2, II8, III8, IV6, V4.

In the skull there are thirteen sharp slightly curved teeth at each side of the lower jaw.

Distribution.

Cape of Good Hope (type locality), Indo-Pacific, Australasia, Atlantic and Pacific coasts of North America, and the coast of France. Records of the species are rare. At least one specimen has been recorded from Ceylon previously, as the specimen on view in the British Museum was presented by Mr. Hugh Neville in 1891 from Trincomalee.

EXPLANATION OF PLATES.

Plate I.—Lateral view of *Kogia breviceps*. $\times \frac{1}{3}$.

Plate II.—Lateral view of the complete skeleton. $\times \frac{1}{3}$.

Plate III.—Lateral view of skull. $\times \frac{1}{3}$.

Plate IV.—Dorsal view of the skull ($\times \frac{1}{3}$) and lateral view of pectoral girdle and skeleton of paddle ($\times \frac{1}{3}$).

[*Note*.—While this paper was in the press, the writer received Schulte's paper on the Skull of *K. breviceps* (Bull. Amer. Mus. Nat. Hist., Vol. XXXVII., 1917, p. 361). He gives a list of twenty-one specimens of the species that have been described up to the present. At least two other specimens are known, both from Ceylon, viz., the Trincomalee specimen presented to the British Museum by Mr. Hugh Neville in 1891, and the Moratuwa specimen, which forms the subject of the present note.—J. P.]

NOTES ON CERTAIN SHORE CRABS.

By C. T. SYMONS, B.A. (Oxon.), F.R.G.S.

THE observations here recorded were made at Neerodumunai, which is a few miles south of Trincomalee, at the outlet of Lake Tamblegam. It appeared advisable to put them on record, firstly, because there do not appear to be many records of the habits of crabs; and, secondly, because there is some discrepancy in the records of the habits of one of the crabs mentioned.

The shore crabs which were watched belonged to three distinct genera, namely, a *Gelasimus*, a *Dotilla*, and a *Scopimera*, the first and third of which have not yet been absolutely identified.

Gelasimus.—The Fiddler or Caller crabs are well known as possessing one cheliped enormously exaggerated in size, and usually of a very distinct pink colour. This enlarged claw may occur on either side of the body, the numbers, so far as I could ascertain, being about equal for each.

Near Neerodumunai there are three colonies of these crabs, and it is very noticeable that they are all situated in positions where the sand is comparatively muddy, only just covered at high tide, and not on the fine soft sand which is so abundant there. In one case the colony is amongst rocks, under some shrubs. Here the crabs are much tamer than in the more open colonies, presumably because a person watching them is mistaken for the overhanging branches. In watching these crabs it is very noticeable that though their sight is very acute, their sense of hearing appears to be very deficient. They remain quite undisturbed while an ordinary conversation is carried on, and I understand that even a gun-shot produces little effect on the colony. The situation of their eyes on long eyestalks renders them very efficient for keeping a good lookout in all directions.

The male members of the colony do not appear to wander far from the entrances to their burrows. All seem to spend most of their time in feeding, and it was their method of doing this which first attracted me to this series of crabs.

As soon as the crabs emerge from their burrows, if not alarmed, they commence to feed, a process which is carried out by means of the chelipeds, the male using only the smaller one. Small particles of sand are passed up to the mouth, being seized by the upper end of the maxillæ. These small particles are then passed downwards, presumably in the process being scraped by the mandibles to remove minute traces of food. The sand thus accumulates at the lower end of the mouth, and when sufficient has accumulated still adhering to the jaws, the ball of sand is carried downwards and backwards by the walking legs and deposited behind the crab. I have not seen these crabs eating anything else, even when such a thing as a small dead fish or crab was available, although other observers report the use of such food. In the colonies of Fiddler crabs, which I watched, the females were certainly in the minority, and usually, so far as I was able to see, lived in small colonies amongst the males, though some appeared to be paired. The females certainly wandered further from their burrows. On one occasion I was watching the colony, and noticed a female wandering about. There were eight males grouped around her in a circle about 2 feet in diameter. These males were in a most excited state, and showed the one most obvious use to which the large pink cheliped is put. They were standing near the entrances to their burrows on tip-toe, *i.e.*, raised on the points of their walking legs and waving their conspicuous chelipeds in the air, all around the female, evidently determined to do their best to arrest her attention. She seemed to be rather frightened or annoyed. When she approached the edge of the circle, a male would attempt to head her off, but they made no attempt to seize her, nor would they venture far from their burrows. Eventually the female wandered away. At times the whole colony of males may be seen in the same excited state, waving their pink "arms" in the air, and hence earning the name of "Caller" crabs. The burrows inhabited by these crabs appear to descend nearly vertically to below sea level, for the crabs when they emerge are quite wet. As the entrances are comparatively small, the large cheliped has to be carried closely folded to the body on

entering, but there appears to be no general rule as to whether the larger arm shall be moved into the entrance first or after the other arm. In the colonies these crabs do not appear to be very pugnacious, and I have never seen the large cheliped used as a weapon of offence. In fact, the animals appear to find it somewhat unwieldy, and do not move it rapidly. Occasionally I saw one crab trespass on the feeding ground of his neighbour, but I never saw a fight. I have seen one male take hold of the cheliped of another, but nothing more happened, so far as I could see.

Alcock,* who gives a description of these crabs, states that "the dismembered chelipeds of the vanquished males could often be seen lying on the battlefield." I have noticed

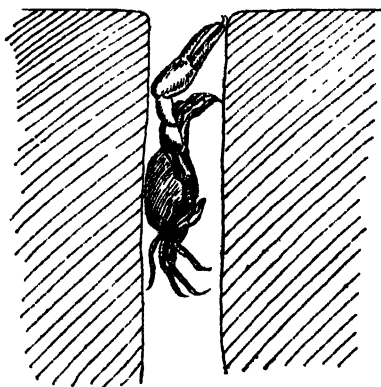


FIG. 1.—*Gelasimus* protecting its burrow.

two uses for the large cheliped, in each of which it was used as a kind of shield. In one case a male when approached by another one, presumably for the purpose of attack, crouched down in a small cavity in the ground and covered himself with his large arm. In the second case the method was similar, except that the crab escaped into his burrow, leaving the cheliped to block up the entrance (Fig. 1). This was evidently quite intentional, because the animal, instead

* A. Alcock: *A Naturalist in Indian Seas*, p. 219.

of carrying the arm folded closely to the body, as is usual on entering the burrow, in this case carried it trailing behind. Tennent, in his "Natural History of Ceylon," says that these crabs, presumably *Gelasimus annulipes*, are common on the sandy shores north and south of Colombo. I have not found any in the immediate neighbourhood of Colombo, but there is a colony to be seen on the island opposite the resthouse at Negombo.

Dotilla.—This species, which I have identified as *Dotilla mycteroides*, is not so striking in appearance as the last one, but in its habits it is more interesting. It is of a dull brown colour, rather globular in form, and is provided rather long arms of equal size with long pointed fingers. It inhabits the fine, rather dry sand nearer the sea than the *Gelasimus*. Its burrows are of much the same form, though smaller, are usually covered at high tide, and thus have to be partly re-made after each tide, as in the case of the others. The diagram (Fig. 2) shows the surroundings of one of the burrows of a *Scopimera* crab, which closely resemble the runways of the *Dotilla*. These crabs are comparatively tame, and as they are small, the best way to watch them is to sit or lie down in the middle of a colony. They will soon emerge, and may be watched at a distance of a few inches if the watcher remains absolutely still. The most noticeable feature of the colony is a series of "pathways" leading to little holes, with heaps of countless little round pellets of sand at one side (occasionally both sides). When the tide has gone down leaving the sand quite smooth, the crab, from inside, breaks open the entrance to the burrow and emerges, at once starting to feed; at first there is no sign of a pathway, and no sign of balls of sand, the feeding crab making both as it feeds. As in the case of the *Gelasimus*, this crab appears to live entirely upon fine particles of food which adhere to the sand. Thus, in order to feed, the crab squats down and starts shovelling sand up to its mouth with the two long "hands" alternately. In this case, as opposed to the habit of the *Gelasimus*, the sand passes into the mouth from below and emerges above to form a sort of ball or pellet, which is held in position by the maxillary palps which extend

outwards from the mouth. When a considerable pellet has accumulated, one of the arms is used to carry the pellet downwards; it is then passed backwards by the legs and deposited on one side. The first part of this latter movement is very rapid, and looks as if the crab was wiping his moustache, so to speak, with his hand. This feeding goes on

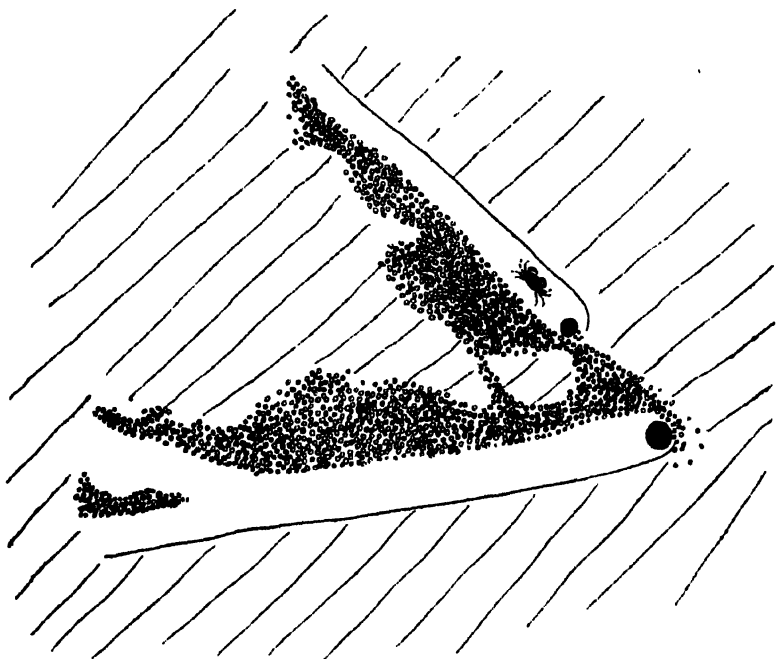


FIG. 2.—Runways of *Scopimera*.

continuously, and the crab works usually in a direct line from his burrow, thus cutting a kind of hollowed-out pathway about half an inch wide, which has the balls of "eaten" sand on one side. Whenever the crab emerges, it appears to go down the pathway and commence feeding. Thus, the smooth sand left by the receding tide is soon covered with lines and piles of pellets of sand, separated seemingly by pathways leading to the burrows of the crabs. The burrows are close together, so that the pellets may be heaped

somewhat haphazard, and though there is in every case a clearly defined pathway, it is not so well defined as with the *Scopimera* crabs.

There is another phenomenon amongst these *Dotilla* crabs which is worthy of mention. As is usual, on the stretches of shore which are exposed at low tide some parts are quite dry, whereas others are comparatively wet during the whole period of low tide. These animals appear to have adapted themselves to both these conditions. Some live, as above described, in burrows in dry sand, while others of the same species live on the wet patches. If such a wet-sand colony be cautiously approached, troops of these crabs may be seen moving about and feeding. When disturbed, they do not scurry away, as *Ocypodes* do, and having no ready-made burrows, they cannot escape as their dry-sand brethren do. Their method is to move to a soft wet patch of sand, if not already there, and then to vanish. This disappearance is at first sight very astounding, as it only takes a few seconds for a whole colony of them to pass out of sight and leave the sand looking almost undisturbed. On closer examination the mystery is explained, when one of them is seen disappearing down into the sand by a kind of corkscrew movement. The animal accomplishes this by digging itself sideways and downwards into the sand. This method of taking cover is only used for temporary escape; for the crabs may be unearthed by disturbing the surface of the sand. I never found one which had penetrated more than an inch under the sand in this way. This habit provides the easiest method of procuring specimens.

When these wet-sand crabs have finished feeding, i.e., when the tide is rising, they have a most ingenious way of providing themselves with a retreat full of air while the tide covers their feeding ground. In the wet sand a small cavity about three-quarters of an inch in diameter is excavated in the shape of a cup (Fig. 3). Then the crab, standing in the middle, starts to carry wet lumps of sand from the bottom and piles them on to the sides. Working very rapidly, he soon (that is, in 2 or 3 minutes) has a complete wet-sand chamber enclosed and roofed in, the air inside being retained by the

wet sand. I watched one do this, waited for a few minutes, and then dug down at the spot and found that the crab and the air chamber had disappeared quite deep into the sand. Presumably, although it is impossible to see this part of the process when the chamber is completely roofed in, the crab goes on working in the same way until the air bubble or chamber is carried down to the requisite depth, so that the tide overhead will not disturb it. In this air chamber the crab remains until the tide has gone down and he can come up again to feed.

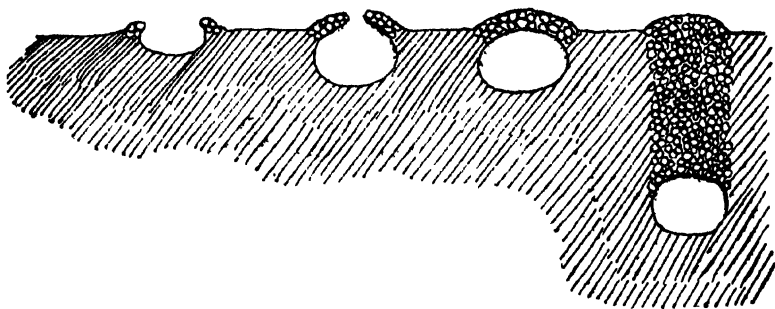


FIG. 3.—Section showing stages in the formation of an air chamber by *Dotilla*.

The habits of a nearly-allied species of crab is described by R. P. Cowles,* who has observed the habits of *Mycteris longicarpus*, Latreille, in the Philippine Islands. But though he gives photographs of the sand pellets and describes the corkscrew descent of the hiding crab, with a plate illustrating the crab in the air chamber, he appears to think that the pellets are thrown up and the air chamber is made by the rapidly-descending crab. As I have recorded above, these two habits are quite distinct. The air-chamber method is used by those which live on the wet sand and have no permanent burrows. In one case I noticed that one of the crabs living on the dry sand most carefully closed up the entrance to his burrow with several lumps of sand, presumably to retain the air inside when the tide came up.

* R. P. Cowles: "Habits of some Tropical Crustacea," II. Philippine Journal of Science, Vol. X., Sec. D, No. 1, p. 11.

Scopimera.—I have not been able to identify the species to which these crabs belong. Their habits closely resemble those of the *Dotilla* just described. They are always to be found on the dry, fine sand just below high-water mark. They are smaller and flatter than the *Dotillas*, and their chelipeds are much more spade-like. Their method of feeding is exactly the same as that of the *Dotilla* species, but the pellets of sand are often as large as the body of the crab before they are removed from the mouth and placed on the heap. Their burrow "paths" and piles of "eaten" sand are much more orderly than those of the *Dotilla*. Just after the tide has fallen and the sand become fairly dry, this neatness is most marked. They work a path, which is about three-quarters of an inch wide, and only scrape it on the surface to form a shallow groove, all the pellets being placed on one side of the path, that is, in eating they always appear to face in one direction. Occasionally an aberrant one is seen, feeding in an irregular manner so far as the pathways are concerned, but the actual method of handling the sand is always the same, and there is no possibility of mistaking the work of one of these crabs for the work of an *Ocypode* in clearing out its burrow.

NOTES.

Viviparous Habit of the Snake Cyndrophis maculatus (Linne).—Among half a dozen Ceylon snakes sent to me recently through the kindness of Mr. Gerard A. Joseph, I found a specimen of *Cyndrophis maculatus*, which proved to be gravid. As far as I am aware, the viviparous nature of this species has not been previously noted; in fact, judging from Boulenger's Catalogue (1893, Vol. I., p. 131 *et seq.*), nothing is known of the breeding habits of any of the species of the family Ilysiidæ. This being so, the specimen referred to by me is of very special interest.

When cut open two foetuses (1 ♂, 1 ♀) were brought to light, each folded twice into three about equal parts, and marked and coloured just like the dam. The ♂, known from its extruded claspers, measured $5\frac{3}{4}$ inches, and the ♀ 5 inches in length, the parent tapering just $10\frac{1}{2}$ inches. Now I find that in most viviparous snakes the young measure at birth about one-quarter the length of the dam, so that the embryos now referred to are relatively very large, being almost half the length of the parent. Such unusual development probably influences the numbers in the brood, which in this case is considerably less than in any other land snake that I am acquainted with. In a paper of mine published in the Bombay Natural History Journal (Vol. XXV., p. 607), I drew attention to the very small broods that two sea snakes (*Enhydria curtus* and *Hydrophis gracilis*) produce. Both usually discharge one or two at a birth, and in the case of the former, the embryos measure at least two-fifths of the dam before birth.

Unfortunately there is no record of the date of capture of this interesting *C. maculatus*.

October 12, 1918.

F. WALL.

Occurrence of Motacilla alba (the White Wagtail) in Ceylon.—On Saturday, November 23, 1918, when walking from the Residency to the Kachcheri at Puttalam I saw a strange Wagtail on the maidan. I went out to look for a specimen in the evening and shot a young male, which turned out to be *M. alba*—the White Wagtail—in its first autumn plumage. There were several other specimens. One I used to see almost daily either in the resthouse compound, or on the maidan between the Residency and the Kachcheri. They stayed until early February. I left Puttalam for a week's circuit in the first week of February, and when I came back they had gone. The specimen I obtained is now in the Colombo Museum.

The species is common in summer throughout Northern Europe and Western Siberia. It winters in North Africa and India, but seldom visits the extreme south of the peninsula, and it has never before been recorded from Ceylon.

December, 1919.

W. E. WAIT.

PROCEEDINGS OF THE CEYLON NATURAL HISTORY SOCIETY.

THE Seventh Anniversary Meeting of the Society was held in the Colombo Museum Library on March 14, 1919, at 5.15 P.M., the Hon. Mr. R. E. Stubbs, C.M.G., President, in the Chair.

The accounts and reports of the Honorary Secretaries and Treasurers for 1918 were read and confirmed.

A vote of thanks was proposed to Mr. W. H. Young for auditing the accounts.

The following office-bearers were elected for the ensuing year:—

Patron.

His Excellency the Governor.

President.

The Hon. Mr. R. E. Stubbs, C.M.G.

Vice-Presidents.

F. M. Mackwood, Esq.

Dr. A. Nell.

Sir S. D. Bandaranayake, C.M.G.

Dr. J. Pearson.

Council.

T. Petch, Esq.	The Rev. Father M. J. Le Goc.
The Ven. the Archdeacon of Colombo	E. Evans, Esq.
Harry Creasy, Esq.	G. A. Joseph, Esq.

Joint Honorary Secretaries and Treasurers.

Messrs. C. T. Symons and W. A. Cave.

New Member :—T. R. Mitchell, Esq.

Further exhibits of photographic animal studies from the Game Sanctuary taken by F. E. Mackwood, Esq., were shown. Some interesting notes on these exhibits were given by Mr. C. T. Symons, who accompanied Mr. Mackwood on the trip.

Twenty-sixth General Meeting.

The Twenty-sixth General Meeting of the Society was held in the Colombo Museum Library on April 24, 1919, at 5.30 P.M., Dr. A. Nell in the Chair.

A paper on "Sex Statistics of the Mullaivivu District, Northern Province," was given by Frederick Lewis, Esq.

Mr. C. T. Symons gave a few short notes on squirrels eating butterflies, white ants working in the open, and some crossed varieties of *Mirabilis jalappa* (Marvel of Peru).

Twenty-seventh General Meeting.

The Twenty-seventh General Meeting of the Society was held in the Colombo Museum Library on May 20, 1919, at 6 P.M., Dr. A. Nell in the Chair.

A paper on "Wild Life at the Water-hole" was given by Dr. R. L. Spittel.

Mr. David Scott gave a short note on the depredations of white ants in the top floor storey of a building in the Fort reinforced with concrete.

Twenty-eighth General Meeting.

The Twenty-eighth General Meeting of the Society was held in the Colombo Museum Library on June 26, 1919, at 6 P.M., Dr. A. Nell in the Chair.

A paper on "Notes on Ceylon Cuckoos and their Eggs" was given by W. E. Wait, Esq., M.A., M.B.O.U.

Twenty-ninth General Meeting.

The Twenty-ninth General Meeting of the Society was held in the Colombo Museum Library on July 17, 1919, at 6 P.M., Dr. A. Nell in the Chair.

A paper on the "Pernicious Weeds in Colombo Gardens" was given by Rev. Father M. J. Le Goc., O.M.I.

New Member :—L. M. Maartenz, Esq.

THE OWLS AND DIURNAL BIRDS OF PREY FOUND IN CEYLON.

By W. E. WAIT, M.A., F.Z.S.

(*With one Plate.*)

THE present instalment of the rough draft for the Handbook on the Birds of Ceylon includes the members of the Orders *Striges* and *Accipitres*. As in the earlier portions, I have followed the classification given by Oates and Blanford in the volumes on Birds in the "Fauna of British India." After this paper had been completed, I had the advantage of meeting with Mr. W. L. Sclater, and of reading the manuscript of his forthcoming rescension of the *Accipitres*. There is no doubt that since Blanford wrote much greater accuracy of classification has been attained, largely by the use of the trinomial system in differentiating sub-species, or geographical races. As, however, Mr. Sclater's work was not complete, and as the adoption of his classification would have entailed the recasting of a considerable portion of my paper, I am publishing it as it stood, in order not to delay its appearance. I hope, however, when the Handbook is published in volume form, to follow the new trinomial classification of Indian birds, which Mr. E. C. Stuart Baker is bringing out in the Journal of the Bombay Natural History Society.

Order **STRIGES.**

Owls.

The Owls form a naturally marked order, lying between the Parrots and the Birds of Prey. They are birds, mainly nocturnal, of very distinctive appearance. The whole plumage is soft and fluffy. In most genera the head is large and densely feathered; the big round eyes are directed

forwards, and are circled with disks of radiating feathers, which may be bordered by a close-set ruff. Many species bear, above the eyes, upstanding tufts of feathers known as aigrettes, horns, or ear tufts. The bill is short, curved, and hooked; its base is furnished with a cere, which is usually covered by stiff bristles concealing the nostrils. The ear openings are generally of large size, and are often protected by a lid or "operculum." The legs are usually, but not always, completely feathered down to the toes. The feet are strong, the toes have sharp, curved claws of moderate length; the hallux or hind toe is always present, the outer toe is reversible.

The coloration, as might be expected in nocturnal birds, is mainly some combination of brown or rufous. Most species breed in hollow trees and lay white eggs, which are almost spherical. The young when born are helpless and covered with down. Owls are carnivorous, the larger species preying chiefly on small mammals and birds, while the smaller forms feed mainly on beetles and various other insects.

Members of the order are found all over the world, and from their silent ghost-like flight, their large eyes, nocturnal habits, and weird cries have always been looked upon in all countries as birds of ill-omen. The usual call is either a hoot or a shriek, but in the forests of India and Ceylon eerie, strangled sounds are heard at night, and are usually supposed to be the alarm calls or mating cries of one or other of the Owls. In Ceylon the identity of this "Devil Bird" is still a subject of much discussion and conjecture. From personal experience, inquiries, and the evidence recorded, I am convinced that the cries vary considerably, and probably are not all made by the same species. In the northern forest tract the cry usually heard is a loud, piercing, single scream, which is audible at a great distance. The villagers in the interior of the Puttalam District ascribe this call, not to an Owl, but to the Crested Hawk-Eagle—*S. cirrhatus*—and I believe that in some cases they are right. I have heard this cry at night in the North-Central Province, and although the effect was blood-curdling, there was a ring in it not altogether unlike the ordinary note of an eagle. The calls described by

other observers in the central and southern parts of the Island differ so from this cry that they seem fairly obviously to be uttered by some other bird, and it is not improbable that more than one species is responsible. Four Owls are held in suspicion. Native legends and belief point to the Brown Wood-Owl—*S. indrani*—a fairly common, large species. Its ordinary note is a resounding “too-whoo,” but tame birds have been known to utter dismal wailing sounds (*vide* Legge, p. 158) where the question is discussed at some length.*

Another bird with equal claims is the Forest Eagle-Owl—*H. nepalensis*. There is in the Colombo Museum a skeleton of this Owl, presented by J. H. Stephens, who stated that he shot it while uttering the cries of the Devil Bird. It is, however, a rare species in Ceylon, though the few specimens recorded come from widely distributed localities, both in the hills and in the low-country. Others, again, state that the Devil Bird is a “small whitish bird,” which would point to the Ceylon Bay-Owl—*P. assimilis*. This is also a rare bird peculiar to Ceylon, and as yet recorded only from the hills and from the forest at their bases. An allied species from northern India—*P. badius*—is said to make an appalling noise. The latter two species are probably genuine “Devil Birds,” but as they are either rare or restricted in range, and as the Devil Bird’s cries are reported from all over the Island, I cannot imagine that they are the sole authors of the ill-omened sounds.

Lastly, the Brown Hawk-Owl—*N. scutulata*—a small species found all over the Island, is mentioned by several Indian observers as making noises like a strangled cat, or a hare caught by hounds. It has not, however, been regarded with suspicion in Ceylon.

The order is divided into two families, the distinction being founded solely on osteological characters, there being no external differences of any importance. In the family *Strigidae*, which includes only one of the eleven species found

* The cries described in the letter from Mr. Mitford, quoted in the passage here alluded to, as having been “heard on the rock at the back of the Residency at Kurunegala,” are probably those made by the Flying Squirrels, which still haunt the same locality and utter wailing calls at night-time.

in Ceylon, the skull is long and narrow, and the "furcula," or merrythought is united to the keel of the breastbone. In the *Asionidæ* the skull is broader, and the furcula is not in contact with the keel of the breastbone.

Family STRIGIDÆ.

Genus, *Strix*.

Screech Owls.

This is a small family, containing only two genera, one of which—*Strix*—is world-wide, the other confined to Madagascar. In the genus *Strix* there are no ear tufts, the facial disk is large and full, and completely surrounded by a ruff of stiff feathers. The bill is weak and compressed, the nostrils are oval; the wings are long and pointed, and when closed reach beyond the tail. The legs are long, the upper part of the tarsus is feathered; on the lower tarsus and toes the feathers become bristles. The middle toe is of about the same length as the inner; the middle claw is serrated on the inner margin. Only one species, the familiar English Barn Owl, is found in the Island. It may be distinguished from all other Ceylon Owls by its pale plumage, and by the combination of the long pointed wings with the slightly serrated comb on the middle claw. The Bay Owl has a serrated middle claw, but the wings are comparatively short and rounded.

STRIX FLAMMEA (Blanford, Vol. III., p. 264; Legge, p. 164).

The Barn Owl; Screech Owl.

. *Description*.—Facial disk white, a rufous patch in front of the eye; ruff feathers white, the outer feathers rufous towards the end and with dark brown tips; back and upper parts tawny-buff and stippled-gray, with a small eye-shaped spot of black and white at the end of each feather; wing quills tawny-brown with mottlings and irregular cross bands of dark grayish-brown and a large amount of white on the inner webs; tail tawny brown with four wavy, slightly mottled bars of dark brown, the tip mottled-white and dark brown, with some traces of eye spots as on the back; the underside of the tail feathers white. Lower parts white, more or less tinged on

the flanks and thighs with very pale buff, and with scattered small triangular dark spots, mainly on the sides of the breast, the flanks, and wing lining.

Bill fleshy-white; cere flesh colour; iris black; bare portion of legs and feet fleshy-brown.

Length about 14; wing 11.25; tail 4.75; tarsus 2.5; bill from gape 1.5.

Distribution.—In Ceylon practically limited to the Jaffna peninsula; a few specimens have been recorded from the north-west coast as far south as Puttalam. It occurs all over the world in tropical and temperate regions, with minor racial distinctions in the various continents.

Habits, &c.—A thoroughly nocturnal bird, frequenting house roofs, outhouses, old buildings, ruins, or occasionally old hollow trees. In Jaffna it haunts the old drainage outlets from the bastions of the fort into the moat. It feeds almost entirely on rats and mice. The cry is a loud and rather weird screech. The birds are noisiest in the breeding season, which at Jaffna is in June and July. The eggs are laid in some hole in a building or tree; generally there is no nest lining, in some cases a few sticks are placed on the floor of the hole. The eggs vary in number from 3 to 6; the shape is roundish oval, the colour white with a creamy tinge, the measurement about 1.69 by 1.28.

Family ASIONIDÆ.

This family comprises ten out of our eleven species. It is again sub-divided into three sub-families as follows:—

Photodilinzæ.—Facial disk and ruff well marked; ear orifice smaller than the eye, and not furnished with an operculum inner margin of the middle claw with a small serrated comb.

Asioninzæ.—Facial disk and ruff well marked; ear orifice larger than the eye, an operculum present; middle claw not serrated.

Buboninzæ.—Facial disk and ruff not well marked; ear orifice smaller than the eye; middle claw not serrated.

Sub-family *Photodilinae*.Genus **Photodilus**.*Bay Owls.*

This sub-family is limited to a single genus of two species, one of which is peculiar to Ceylon. Both are of medium dimensions, being slightly under a foot in length. As in the genus *Strix*, the inner margin of the middle claw is furnished with a slightly serrated file-like process or comb. The wings, however, are much shorter and rounded. The tarsus is feathered throughout, the inner toe is longer than the middle. The facial disk is very distinct, but the ruff is not quite complete above the eyes. The Ceylon species can be told apart from all our other Owls by the pinkish tinge of the face and lower parts.

PHOTODILUS ASSIMILIS (Blanford, Vol. III., p. 269).

PHODILUS ASSIMILIS (Lodge, p. 161).

The Ceylon Bay Owl.

(See Fig. 1.)

Description.—Forehead and facial disk vinous-pink; feathers round the eye chocolate; ruff white tipped with chestnut and black; feathers of the crown and nape dark chestnut, flecked in the centre with black and paler chestnut, a few feathers sometimes whitish; remainder of upper parts a mixture of chestnut and rich tawny-buff, marked with smallish triangular spots of black, which on the scapulars and wing coverts are flecked with white; wing quills chestnut on the outer, dark grayish-brown on the inner webs, both webs being barred with black; on the long winglet feathers, on the outer web of the first primary, and on the ends of the outer webs of the next two or three primaries the spaces between the black bars are white; tail rufous chestnut with narrow black bars.

Throat and chest buff, shading into pale vinous-pink on the remainder of the under parts; most of the feathers with two dark brown spots on the centre; the thigh plumes sometimes silky-white; wing lining buff with a patch of deep chocolate brown at the base of the primaries.

Bill greenish-white ; iris dark brown ; feet pale whitish-green.

Length about 11 ; wing 7·75 ; tail 3·5 ; tarsus 1·65 ; bill from gape 1·25.

Distribution.—A rare bird peculiar to Ceylon. A few specimens have been obtained in the hills under 3,000 feet, and in the forest country at the foot of the ranges.

Habits, &c.—There is little on record regarding these. The species is nocturnal and lives in the forest. The nest has been found on Martin's town estate, near Rakwana. It was made in the hole of a tree, and was composed of dry twigs, moss, and feathers. The parent bird and three young were taken from the nest in November, so it would appear to breed towards the end of the year and to lay three eggs. As stated in the remarks on the order, this Owl is probably the author of some of the eerie cries of the Devil Bird. Mr. E. C. Stuart Baker informs me that the North Indian species—*P. badius*—makes a noise "like half a dozen mad cats."

Sub-family *Asioninae*.

Eared Owls and Wood Owls.

The two Ceylon members of this sub-family are of fairly large size. The ear orifice is larger than the eye, and is furnished with an operculum. The facial disk is well marked and the ruff distinct. The tarsus and upper surface of the toes are fully feathered. The legs and feet are fairly strong, but not so stout and formidable as in the Fish and Eagle Owls.

Rough Key to Ceylon Species.

A.—Length about 15 ; wings long and pointed ; ear tufts well marked.

Asio accipitrinus (The Short-eared Owl).

B.—Length about 18 ; wings rounded ; no ear tufts.

Syrnium indrani (The Brown Wood Owl).

ASIO ACCIPITRINUS (Blanford, Vol. III., p. 271 ;
not in Legge).

The Short-eared Owl.

Description.—Facial disk pale tawny-buff, the feathers round the eye black ; the ruff rich buff, streaked and speckled with dark brown ; upper plumage buff, broadly streaked and mottled with dusky-brown ; on the scapulars and longer wing coverts the buff colour is paler ; primary quills chestnut-buff with broad tips and irregular bands of dark brown ; secondaries buff, banded with brown ; tail tawny-buff with irregular brown bars. Lower parts buff with longitudinal streaks of brown, broad on the breast and narrow on the abdomen ; the lower abdomen, legs, and under tail coverts are unmarked.

Bill black ; iris deep yellow ; claws black.

Length about 15 ; wing 12·25 ; tail 6 ; tarsus 1·6 ; bill from gape 1·2.

Distribution.—On several occasions in recent years this Owl has visited Ceylon in some numbers. In November, 1896, seven specimens were recorded from Jaffna, and next February two from the Horton Plains. There was another strong invasion about Christmas, 1904, when ten specimens were obtained in Colombo alone. The species is a migrant found almost all over the world, breeding in temperate climates, and visiting warmer regions in winter.

Habits, &c.—In Ceylon most of the specimens have been secured immediately on their arrival. In India this Owl is met with chiefly in grass plains, but sometimes in low bush or cultivated lands. It is largely nocturnal, and feeds principally on small mammals.

SYRNIUM INDRANI (Blanford, Vol. III., p. 275 ;
Legge, p. 155).

The Brown Wood Owl.

Description.—Loral plumes black, fringed with dirty-white ; facial disk rufous-tawny, whitish above the eyes, the feathers round the eye black ; ruff and chin dark chocolate-brown ; Crown and upper plumage dark sepia-brown ; scapulars, wing

coverts, rump, and upper tail coverts paler, and with narrow whitish bars; wing quills deep brown with paler brown crossbars; tail feathers brown with narrow white tips and crossbars. Under parts and legs whitish or yellowish, closely barred with dark brown.

In young birds the feathers have broad whitish edges, the whole of the upper plumage is barred, but the under parts are white, and only gradually assume the barring of the adult phase.

Bill bluish near the cere, whitish-horny near the tip; cere dusky-bluish; iris deep brown; claws bluish.

Length about 18; wing 12.25; tail 7; tarsus 2.15; bill from gape 1.5. Males slightly smaller than females.

Distribution.—May be met with in forest over the whole of Ceylon from sea level to Nuwara Eliya. In India the species is rarely found on the plains, but occurs in the Himalayas and on the hills of the Malabar Coast. It has been recorded from a few other localities in India proper, Burma, and Formosa. The Himalayan form is probably a good sub-species, much larger than our Ceylon bird.

Habits, &c.—A fairly common species, found mainly in heavy jungle. At times it may be seen during the day being mobbed by drongos and other small birds. It feeds on small birds, lizards, and, at any rate in captivity, on small fish. The note is of four syllables "oot-oot-tu-whoo," but the first two syllables can only be heard when close at hand. As noted in my remarks on the order, this is the species commonly credited with the cries of the Devil Bird. The breeding season is during the early part of the year: two eggs are laid in a hole in a large tree, but in India stick nests have been found, placed on a rocky shelf, or in the fork of a tree. The eggs are of the usual owl type. North Indian eggs measure about 2.25 by 1.81.

Sub-family *Buboninae*.

Fish Owls, Eagle Owls, and Owlets.

This sub-family comprises a much larger variety of forms than the other two, and includes seven Ceylon species: our two largest Owls and five owlets.

The Fish and Eagle Owls are large birds with well-marked ear tufts, powerful beaks, stout legs and feet, the latter armed with powerful talons, and rounded wings. The Fish Owl, as suits its mode of life, has a naked tarsus; the Eagle Owl has its legs feathered to the toes, and differs from most Owls in possessing a completely distinct immature plumage.

The Owlets fall into three genera: *Scops*, with ear tufts and a streaky upper plumage; *Glaucidium*, with no ear tufts and a barred upper plumage; and *Ninox*, which is very hawk-like in appearance, as it possesses no ear tufts, and the ruff and facial disk are not developed.

Rough Key to Ceylon Buboninae.

I.—Size large; length 20 or over; ear tufts present.

(1) Tarsus naked.

Ketupa zeylonensis (The Brown Fish Owl).

(2) Tarsus feathered.

Huhua nepalensis (The Forest Eagle Owl).

II.—Size small; length under 12.

A.—Ear tufts well developed (genus *Scops*).

(1) Wing about 5.25; third primary longest, first longer than eighth.

S. giu (Scops Owl).

(2) Wing about 5.85; fourth or fifth primary longest, first much shorter than eighth.

S. bakkamæna (Collared Scops Owl).

B.—Ear tufts absent.

(a) Upper plumage barred (genus *Glaucidium*).

(1) Abdomen transversely barred.

G. radiatum (Jungle Owlet).

(2) Abdomen longitudinally streaked.

G. castanonotum (Chestnut-backed Owlet).

(b) Upper plumage not barred.

Ninox scutulata (Brown Hawk Owl)

KETUPA ZEYLONENSIS (Blanford, Vol. III., p. 281 :

Legge, p. 127).

The Brown Fish Owl.

Description.—Bristly loreal plumes white at the base, black towards the tips ; cheeks tawny with black shaft-stripes ; upper parts light chestnut-brown with broad black shaft-stripes ; lower back, rump, and upper tail coverts a little paler and with narrow shaft-stripes ; scapulars, tertiaries, and wing coverts considerably mottled with whitish, the outer webs of the outer scapulars white ; wing quills and tail feathers dark brown, barred and tipped with dusky buff, which becomes almost white on the outer webs of the larger primaries. Throat white with dark shaft-stripes, in some birds the white throat patch is almost absent ; feathers of remaining lower parts with fine wavy pale brown crossbars and bold black shaft-streaks. Bill yellowish-green ; cere pale dusky-green ; iris golden-yellow ; legs greenish or yellowish.

Length about 21 ; wing 15 ; tail 7.5 ; tarsus 2.75 ; bill from gape 2.

Distribution.—Fairly common and well distributed over the whole of the low-country, ascending the larger river valleys up to about 3,000 feet. It occurs in suitable localities throughout the Indian Empire, extending eastwards to China, while westwards it re-appears in Palestine.

Habits, &c.—This species is generally found in fairly thick jungle near water. During the daytime it roosts in large trees. Its cry is a deep triple note "tu-whoo-hu." Its food is composed mainly of fish, but it will also eat small animals, snakes, large beetles, &c. It breeds about April, making a scanty stick nest on the ledge of a rock near water. At times it will lay in the hollow of a tree or even appropriate the deserted nest of a Fish Eagle. The two white, broad, oval eggs are fairly glossy, and measure about 2.30 by 1.75.

HUHUA NEPALENSIS (Blanford, Vol. III., p. 287).

BUBO NIPALENSIS (Legge, p. 131).

The Forest Eagle Owl.

Description.—Bristly loreal feathers, cheeks and ear coverts grayish-buff with rather darker shafts ; ear tufts blackish-brown, sometimes barred on the inner webs with whitish-buff :

upper plumage glossy sepia-brown with narrow cross bands and edges of tawny-buff; on the scapulars and wing coverts these pale cross bands become broader and are mottled with brown; wing quills dark brown with bands of smoky gray; tail with mottled bands and tips of buff. Lower parts white, at times tinged with buff, with broad brown crescent-shaped bars.

Young birds are white or buff, with crescent-shaped dark brown bars on both upper and lower plumage; quills and tail feathers as in adults.

Bill yellow; iris brown; toes yellow.

Dimensions variable; females, as a rule, are larger than males. Length about 23; wing 15.3-18; tail 7.5-9.5; tarsus 2.60; bill from gape 2.

Distribution.—Not very common, but found apparently as much in the low-country forests as on the hills. Specimens in the Colombo Museum come from Kurunegala; Giriulla, North-Western Province; and Batticaloa. If this species is the only Devil Bird, it is found fairly generally throughout the Island. In India, like *Syrnium indrani*, this is a hill species, occurring in the lower Himalayas and the hill ranges of Assam and Southern India. It is also recorded from one or two localities in Burma.

Habits, &c.—A forest bird, but found more in scattered clumps of large timber, such as the wooded gorges of the patanas, and on the edges of thick forest than in the heart of the jungle. Not much is known of its mode of life, as it is a nocturnal bird seldom seen. To judge from its size and powerful talons, it probably hunts fairly large game, and appears to live mainly on birds. In India it is credited with killing pheasants, hares, and even young deer. The cry is described by Jerdon as a low, deep, and far-sounding moaning hoot. I have discussed in my remarks on the order the claims of this species to be the Devil Bird. Nothing appears to be known of its breeding habits in Ceylon. In India the nest has been found in Northern Cachar. It consisted of a broad platform of sticks and grass, placed about 6 feet from the ground in a large fig tree. One white egg of the usual type measured about 2.21 by 1.87.

SCOPS GIU (Blanford, Vol. III., p. 291).

SCOPS SUNIA (Legge, p. 139); S. MINUTUS (Legge, p. 143).

The Scops Owl.

Description.—General colour above grayish-brown, more or less tinged with rufous, finely stippled with black and white, and with dark shaft-stripes and some lighter patches. The lores are whitish, some of the bristles with black tips; remainder of facial disk light grayish-brown with slightly darker markings; ruff feathers narrowly tipped with black; the outer scapulars have the outer webs whitish tipped with black; wing coverts with pale spots which are sometimes indistinct; wing quills rufous-brown with irregular dark barrings and pale patches, most distinct on the outer webs of some of the primaries; tail pale sandy-brown, mottled and irregularly barred with darker-brown. Lower parts grayish-buff, vermiculated with sandy brown, and with irregular but fairly conspicuous shaft-stripes of black-brown.

Rufous Phase.—The ground colour of the upper plumage, including wings and tail, almost uniform pale rufous chestnut with black shaft-stripes, most conspicuous on the head; the white outer webs of the scapulars stand out most distinctly, and are bordered behind with black. Lower parts much the same as in the gray phase, but tinged with rufous.

Bill olive-brown; cere greenish; iris yellow; feet fleshy-brown.

Length about 6·5; wing 5·25; tail 2·2; tarsus ·75; bill from gape ·75.

Distribution.—Blanford regards a variety of gray Indian forms, which others divide into several species, as merely local races of *Scops giu*, which ranges over central and southern Europe and Asia and the greater part of Africa. Of these local races, our Ceylon bird—Legge's *S. minutus*—is the smallest and darkest. *S. sunia* of some authors is held by Blanford to be merely a rufous phase, which may occur in any of the Indian forms. Both the rufous and gray birds are extremely rare in Ceylon, but have been recorded from a few widely scattered localities both in the hills and the low-country.

Habits, &c.—Found in the outskirts of jungle, or in isolated thickets and round lonely bungalows. A nocturnal species, feeding on insects and at times small birds and mammals. The cry according to Legge is a feeble “woot-woot.” This agrees with the note recorded for the Indian species. A. L. Butler,* however, says the note of the Ceylon bird is “hoot-coorroo.” Legge noticed a similar call, but thought it was possibly the cry of *Ninox scutulata*. This cry may be heard at night at several of the wilder circuit bungalows and rest-houses in the northern forest tract. It is really a four-syllabled cry, “wook took-toorroo,” the first note not carrying so far as the others. I am inclined to put it down as the call of *Batrachostomus moniliger*, as the cadence seems more like the note of a Nightjar than of an Owl. If, however, Butler is correct, our Ceylon bird having a cry so different from the Indian form must surely be a distinct species. The point requires further elucidation. Little is known of the nidification in Ceylon, but such a well-marked local race must breed in the Island. Indian forms are largely migratory, but breed in certain hill localities, laying three or four white eggs in holes of trees.

SCOPS BAKKAMÆNA (Blanford, Vol. III., p. 297).

SCOPS BAKKAMUNA (Legge, p. 135).

The Collared Scops Owl.

Description.—Bristly loreal feathers grayish or buffy-white tipped with black; facial disk grayish, or at times rufescent, with darker pencillings; ruff feathers buff, boldly tipped with blackish-brown; the forehead, a broad eyebrow, and the inner webs of the ear tufts grayish or buffy-white pencilled with black; upper plumage buff or grayish finely vermiculated with blackish-brown, and with broad black shaft-stripes on some of the feathers; crown and nape almost black, more or less mottled with buff; a more or less distinct collar on the hind-neck, formed by buff feathers with dark edges:

* Journal Bombay Nat. Hist. Society, Vol. XII., p. 570.

the outer webs of the outer scapulars are buff bordered with black; wing quills brown with paler mottled bands and tips, the pale bands becoming white patches on the outer webs of the primaries; tail brown mottled and banded with smoke gray or tawny; chin buff or whitish; throat, breast, and remainder of lower parts grayish or tawny-buff, more or less marked with fine wavy crossbars of brown and with occasional bold black-brown shaft-stripes; legs, vent. and under tail coverts generally unmarked. Some birds are grayer, others more rufous.

Bill greenish-horny, darker above: iris chestnut or reddish yellow; feet brownish-olive or greenish.

Length 8; wing 5.85; tail 2.6; tarsus 1.25; bill from gape .85.

Distribution.—The commonest small Owl in the Island, most abundant in the west and south, especially near the sea, rarer in the north and east. In the lower hills it is found up to about 3,000 feet. It occurs all over the Indian Empire and Malaya, including the Archipelago. As in the last species, there are several distinct local races, raised by some to the rank of species. As usual, Ceylon and Southern Indian forms are the smallest and darkest.

Habits, &c.—A nocturnal species, occurring largely in cultivated country, and even in town gardens. Its monotonous little "wok, wok" is frequently heard after dark in Colombo. The birds go about in pairs. For months a couple slept every day side by side in a tall shady thorn bush in my compound at Puttalam. It feeds mainly on insects and other small fry. The breeding season appears to be about February, March, and April. It nests in hollow trees, or in the angle between the frond and stem of a palm. A few leaves or blades of grass are sometimes placed as a lining, but in the only two nests I have found the eggs were laid on the chips of rotten wood at the bottom of the hole. In Ceylon two eggs appear to be the usual number, occasionally three. They are of the usual shape, almost spherical, and not very glossy. They soon become stained with yellow. The average of four Ceylon eggs is 1.24 by 1.09.

GLAUCIDIUM RADIATUM (Blanford, Vol. III., p. 306 ;
Legge, p. 152).

The Jungle Owlet.

Description.—Lores whitish with dark tips ; the sides of the head and neck, the crown and the upper plumage, the wing coverts, tertiaries, and upper tail coverts dark brown with narrow bars of pale rufous or white ; some white spots on the scapulars and wing coverts : wing quills barred with rich dark brown and rufous, the latter colour paling into whitish at the edge of the larger primaries and near the tips of the secondaries ; tail feathers black-brown with narrow white tips and crossbars. The chin and a band on each side of the throat whitish : remainder of lower parts whitish-buff with numerous bars of olive-brown which become rather arrow-shaped on the abdomen and fade away on the legs and lower tail coverts.

Bill greenish-horny : cere greenish : iris yellow ; feet greenish-yellow.

Length 8 : wing 5·1 : tail 2·6 : tarsus ·9 : bill from gape ·75.

Distribution.—Fairly widely distributed over the southern half of the Island, being commonest in the Eastern Province. It is found also in the Uva hills. It occurs in well-wooded country over the greater part of India.

Habits, &c.—Found in tall forest and dense jungle, or occasionally in scrub jungle near the sea. It is very seldom seen, but its presence may be detected by its peculiar call, which is uttered during the daytime when the weather is dull or cloudy. This call is described by Legge as starting “ with the syllable k̄ow, slowly repeated, and gradually accelerated until changed to k̄ow whap, k̄ow whap, which increases in loudness till suddenly stopped.” Its flight is straight and strong. It feeds on beetles and other insects, and also on small birds, even attacking young chickens. In India it breeds during April and May in holes of trees, laying two or three smooth white glossless eggs averaging 1·25 by 1·06.

GLAUCIDIUM CASTANOTUM (Blanford, Vol. III., p. 307 ;
Legge, p. 149).

The Chestnut-backed Owlet.

Description.—Lores whitish with dark tips ; whole head, sides and back of neck, throat, chest, and sides of breast dark brown with narrow transverse bars of whitish-buff ; on the back and sides of the lower neck the bars are broader and pure white, forming a broken white collar ; the back, scapulars, wing coverts, and tertiaries reddish-chestnut with faint dark bars ; at times there are some pale spots on the scapulars and wing coverts ; wing quills brown with rufous bars, which become almost white on the inner webs of the secondaries ; upper tail coverts and tail brownish-black with narrow white crossbars. Chin and a band on each side of throat white ; a white patch in the centre of the fore-neck ; centre of breast and remainder of lower parts white, with broad longitudinal streaks of dark brown on the abdomen and thigh plumes.

Bill greenish-horny ; cere dusky-greenish ; iris yellow ; feet olivaceous.

Length 7·5 ; wing 5·15 ; tail 2·5 ; tarsus ·85 ; bill from gape ·75.

Distribution.—Peculiar to Ceylon ; found in the hills, the forest tracts at their base, and the wet zone of the low-country, being not uncommon round Colombo.

Habits, &c.—Occurs in forest or jungle, also in thickly planted native gardens. A shy bird, keeping to the top branches of tall trees. It is fairly diurnal in its habits. The note is a curious little “craw.” Like other small Owls, it feeds on insects, lizards, small birds, mice, &c. It breeds from March to May in holes in trees, laying two white oval eggs on the bare wood. Average size about 1·37 by 1·11.

NINOX SCUTULATA (Blanford, Vol. III., p. 309 ;
Legge, p. 145).

The Brown Hawk Owl.

Description.—Feathers of the lores and edge of the forehead white at the base and black at the tip ; the sides of the head and neck, the crown, and upper plumage chocolate-brown.

often grayer on the head and neck ; some concealed white patches on the outer scapulars ; edge of wing white ; wing quills brown, crossed by narrow bars, which at the ends of the primaries are only slightly paler than the ground colour, but become white on the inner webs of the secondaries and across the tertiaries. Tail feathers equally barred with black and smoky-brown, and tipped with whitish. Chin and upper throat dirty-white with black shaft-stripes ; fore-neck, breast, and flanks rich chocolate-brown with paler lateral margins ; lower down these lateral margins increase and become white, while the brown centres of the feathers dwindle into heart-shaped spots on the abdomen, and into bars on the thighs ; lower tail coverts almost entirely white.

Bill bluish-black ; cere dull-greenish ; iris golden-yellow ; feet dusky-yellow.

Length about 11·5 ; wing 7·65 ; tail 4·5 ; tarsus 1 ; bill from gape ·85.

Distribution.—Fairly widely distributed throughout the low-country, and in the hills up to about 4,000 feet. It occurs in the well-wooded parts of the Indian Empire, and ranges throughout the Oriental region.

Habits, &c.—Found mainly in thick jungle, preferably on the borders of tanks or on river banks. The cry, much more musical than that of other owls, is a clear low “ooo-ook,” which may be heard, especially on moonlight nights, soon after sunset and again towards midnight. It also continues to call in the morning till some time after sunrise. This species feeds almost entirely on insects. It breeds from about Christmas to April, laying two or three almost spherical white eggs in holes of trees. A Ceylon egg measured 1·45 by 1·27.

Order **ACCIPITRES.**

Birds of Prey.

The diurnal Birds of Prey found in the Indian region fall into a very natural group, with the Osprey forming a probable connecting link between the rest of the order and the Owls. By some authors, indeed, the Osprey is placed in an

intermediate order, but Blanford includes it in the *Accipitres*, giving it rank only as a separate family.

The *Accipitres*, which are found all over the world, agree with the Owls in the structure of the palate, in the strong, much-hooked beak, furnished with a cere, and in their curved claws. They differ in the position of their eyes, which are directed laterally and not forwards, while the plumage is firmer and not so fluffy. The females in most species are larger than the males. The young when hatched are helpless and covered with down. The nest is usually a large structure of twigs placed in a tree, or on a rocky ledge. The eggs are often white, but generally more or less blotched with red or brown.

Indian members of the order are divided into three families :—

(1) *Pandionidæ*—The Osprey, in which the outer toe is reversible, i.e., provided with more or less the same power of movement as the human thumb, and capable of being directed backwards or forwards. The contour feathers are not provided with an after-shaft.*

(2) *Vulturidæ*—Vultures. In this family the contour feathers are provided with an after-shaft, while the outer toe is not reversible. The crown of the head is either wholly naked, or covered only with down.

(3) *Falconidæ*.—Eagles, Hawks, and Falcons. These agree with the Vultures in the non-reversible outer toe and the presence of an after-shaft, but have the crown of the head fully feathered.

Family PANDIONIDÆ.

Genus *Pandion*.

The Osprey.

The Osprey or Fishing Hawk, as stated before, differs from all the other members of the order in having no after-shaft to the feathers, and in possessing a reversible outer toe.

* The after-shaft is a miniature feather springing from the inner surface of the shaft of the main feather at its base. It can generally be well seen on the breast feathers of an Eagle or Hawk.

The family is confined to a single genus and species, which, however, is found nearly all over the world. The bill is of moderate size and much hooked; the nostrils are small, narrow, and oblique; the long and pointed wings, when closed, extend beyond the tip of the tail. The tarsus is short, naked, and reticulated; the under surface of the toes is provided with prickly scales; the claws are much curved and slightly rounded beneath.

PANDION HALLÆTUS (Blanford, Vol. III., p. 314;
Legge, p. 122).

The Osprey.

Description.—Head and neck white, the middle and sometimes the sides of the crown and nape with broad brown shaft-stripes and tips; a broad brown band runs from each eye down the sides of the neck; upper parts pale glossy brown; wing quills blackish-brown; tail feathers brown, tipped with whitish and barred with paler brown, the bars becoming fainter in old birds. Lower parts white, the feathers of the upper breast with dark shafts and brownish centres of varying width; the flanks also partially streaked with brown.

In young birds the brown feathers of the upper parts are edged with whitish, the tail is more distinctly barred, and the breast is quite white, or only faintly spotted with brown.

Bill black; cere dull greenish-blue; iris yellow; legs and feet greenish or yellowish.

Females: Length 22; wing 20; tail 8·5; tarsus 2·25; bill from gape 1·6. Males are rather smaller; wing about 18·5.

Distribution.—A winter visitor, mainly to the north of the Island, where it is said to be fairly common on the lagoons. It has been recorded from Galle, Moratuwa, and the Ratnapura District. It is a world-wide species, occurring over the whole Indian Empire in winter, though probably few birds remain south of the Himalayas in the breeding season.

Habits, &c.—This species in Ceylon seldom goes inland, but haunts brackish lagoons, estuaries, or sometimes the open coast. When at rest it may be seen perched on dead trees,

guide posts in channels, &c. It often soars at a considerable height, and may then be recognized by its long-pointed wings and quick circling movements. It feeds wholly on fish, which it catches in its talons, dropping on its quarry often from a considerable height.

Family VULTURIDÆ.

Vultures.

The true Vultures are confined to the warmer regions of the old world, but are unknown in the Malay Archipelago, Madagascar, and Australia. They are practically unrepresented in Ceylon, as only a chance straggler of a single species of Scavenger Vulture has been recorded. This gap in our Avifauna is curious, as one would have imagined that there was abundant opportunity for such birds—which are common in the Indian peninsula—to find a living in the Island. They feed on dead animals, or even excrement, and the absence of feathers from the head and neck, which is the distinguishing feature of the family, is a modification highly necessary for birds of such unclean habits. In other respects they closely resemble Eagles and Hawks.

The only species recorded from Ceylon is the smallest of the family and belongs to the genus *Neophron*. The bill is long and slender, straight at the base, with a sharply-hooked tip; the cere is very long. The head and upper fore-neck are naked, and below the naked portion is a ruff of hackles. The crop also is naked. The wings are long and pointed; the tail wedge-shaped; the tarsus is fairly long and partly feathered.

NEOPHRON GINGINIANUS (Blanford, Vol. III., p. 326;
Legge, p. 2).

The Smaller White Scavenger Vulture.

Description.—Plumage in general whitish; the neck hackles often with a rusty stain; primaries mainly black, ashy-white on the outer web near the base; secondaries dark brown with some ashy-white on the outer web; tertiaries pale brown.

Young birds are blackish-brown, with fulvous tips to the feathers, and gradually change to the adult plumage.

In adults the bill is horny-yellow ; cere and naked skin of head and neck yellow ; iris dark brown ; legs dirty-yellow. In young birds the bill is dark, and the naked skin of the head and neck gray.

Length 24 ; wing 18·25 ; tail 9·5 ; tarsus 3 ; bill from gape 2·4.

Distribution.—A solitary specimen, probably a storm-driven straggler, was shot at Nuwara Eliya in March, 1874. The species is found over the greater part of India, south of the Himalayas, and westwards of lower Bengal.

Habits, &c.—In India this bird is a regular town scavenger, living largely on human excrement and other filth. It is, however, also found in open country, away from human habitations.

Family FALCONIDÆ.

Sub-family **Falconinæ**.

Eagles, Hawks, Falcons, &c

In Blanford's classification the whole of the Eagles, Hawks, and Falcons found in Ceylon—some twenty-nine species—fall within the single sub-family *Falconinæ*, which includes birds ranging in size from the Eagles to the Sparrow-Hawks and Falconets. They are practically all carnivorous, and the greater number of them feed on living prey. Some of our smaller species are partly or wholly insectivorous, while others, especially the Kites, feed on carrion.

Most of the sub-family undergo considerable changes of plumage between their immature and fully adult phases ; in consequence coloration is often a very unsafe guide for the differentiation of the various species. There are, however, noteworthy characteristics of the bill, lores, wings, and tarsi, which serve to divide our twenty-nine forms into small, fairly well-marked groups, without altering the sequence adopted by Blanford, or greatly disturbing the natural affinities of the various species. I propose, therefore, for the sake of simplicity, in the first place to split the sub-family into nine small groups, and to treat each group separately.

In most groups the tarsus is naked behind, and only partially feathered in front ; the upper mandible of the bill is sharply

hooked, and its cutting edge between the hook and the cere has a wavy outline or "festoon"; the feathers of the lores—i.e., the space in front of the eye—are mere bristles or end in bristles. Exceptions to these general characteristics serve to mark out several of the groups, as will be noted below :—

Group I. : Hawk Eagles.—Legs feathered all round down to the toes. Six large or fairly large species.

Group II. : Serpent and Fish Eagles.—Three large, stoutly-built species, well over 20 inches in length. Tarsus over 3 inches in length, and only partially feathered. Wings broad and rounded, long in the Fish Eagles, and short in the Serpent Eagle.

Group III. : Kites and allied Species.—Two fairly large and one small species. Tarsus short, only about half as long again as the measurement in a straight line from the gape to the tip of the bill. Toes short.

Group IV. : Harriers.—Four species : one fairly large, three of medium size. Form slender ; wings long and pointed ; tarsus long and slender, feathered in front only at the base, the naked portion covered in front with transverse shields and behind with polygonal scales.

Group V. : Buzzards.—One rare species of medium size. Wings long ; tarsus long and fairly stout, feathered in front to halfway down or more, the naked portion covered both in front and behind with transverse shields.

Group VI. : Hawks.—Three small species. Wings short and rounded ; tarsus long.

Group VII. : Honey Buzzards.—One rarish species of fairly large size. Face, lores, and eyelids covered with small overlapping scale-like feathers. Wings long, tarsus short, toes very long and scaly.

Group VIII. : Bases.—Two rare, smallish species. Bill with two "teeth" or notches on the upper mandible opposite the end of the lower mandible. Head crested ; wings moderate ; first quill much shorter than fourth.* Nostrils linear.

* In young birds there is at times only one notch, but such birds may be distinguished from Falcons by the shortness of the first quill.

Group IX. : Falcons.—Six medium or small species. Bill with one notch on the upper mandible. No crest; wings long, first quill not shorter than fourth. Nostrils round.

Group I.—Hawk Eagles.

The Hawk Eagles differ from the true Eagles, which do not occur in the Island, by their slimmer build, longer tails, and more slender tarsi. They resemble them, however, and differ from all the remaining groups in having the tarsus clothed all round down to the toes with fine close-set feathers. They are all birds of large or fairly large size, armed with powerful bills and talons, and flying with a fine bold sweep. The note is generally a loud, clear call. Among the villagers of the Puttalam District the Crested Eagle—*S. cirrhatu*s—is put down as the author of the Devil Bird's cry, and a loud, resounding, eerie scream, which I have heard at night in the northern forest tract, seemed certainly more like the cry of an Eagle than of an Owl. The six species found in Ceylon are mostly rare. They are divided among four genera. The main generic and specific differences are shown in the following key :—

Key to Ceylon Species.

I.—Wings long; when folded the tip of the longest primary exceeds the tip of the longest secondary by more than the length of the tarsus.

A.—Claws much curved; hind claw longest.

(a) No crest; mid-toe without claw not much longer than bill.* Genus *Hieraetus*.

(1) Larger: wing well over 18.

H. fasciatus (Bonelli's Eagle).

(2) Smaller: wing under 17.

H. pennatus (Booted Eagle).

(b) A wedge-shaped crest on the nape; mid-toe without claw more than half an inch longer than the bill.

Lophotriorchus kieneri (Rufous-bellied Hawk Eagle).

* I.e., the distance from the gape to the tip of the upper mandible, measured in a straight line, not round the curve.

B.—Claws not much curved ; inner claw longer than hind claw.

Ictinaetus malayensis (Black Eagle).

II.—Wing short ; primaries exceed secondaries by less than the length of the tarsus ; a long thin crest on the crown. Genus *Spizaetus*.

1) Smaller ; wing up to 15 ; lower parts plain or streaked but not crossbarred.

S. cirrhatus (Crested Hawk Eagle).

(2) Larger ; wing over 16 ; lower parts crossbarred.

S. keliarti (Legge's Hawk Eagle).

HIERAETUS FASCIATUS (Blanford, Vol. III., p. 343).

NISAETUS FASCIATUS (Legge, p. 36).

Bonelli's Eagle.

Description.—Adult : Upper plumage deep brown, the feathers with white bases ; eyebrows and sides of neck streaked with white ; cheeks and ear coverts streaked with brown ; sides of face white ; upper tail coverts with pale margins ; wing quills black, the bases of the inner webs mottled with white ; tail feathers brownish-gray above, almost white underneath, with a broad band of dark brown at the tip, and irregular wavy bars of the same colour near the base. Lower parts white with black-brown shaft-stripes of varying width ; thigh plumes and lower abdomen more or less pale brown with the same dark streaks ; under tail coverts with light brown crossbars ; wing lining black-brown marked along the edge with white.

In some old birds the ground colour of the lower parts is buff, and the thighs and abdomen are darker.

Young birds are lighter above, with pale edges to the feathers of the crown and nape ; lower parts brownish-rufous with narrow dark stripes ; the wing quills are more banded ; the tail is smoky-brown without the dark broad terminal band but with numerous, narrow, wavy, dark bars.

Bill bluish-gray, darkening to black at the tip ; cere and gape yellowish ; iris bright yellow or brownish-yellow : feet yellowish or whitish-brown.

Male : length 27 ; wing 19 ; tail 11 ; tarsus 3·6 ; middle toe 2·4 ; bill from gape 2·15. Females are larger ; length 29 ; wing 20.

Distribution.—Only once recorded from Ceylon.* It occurs throughout India, west of the Bay of Bengal, and ranges westward through South-western Asia to Northern Africa and Southern Europe.

Habits, &c.—A powerful species, which kills its own prey, and never touches carrion. It feeds largely on mammals and small birds, especially pigeons. It is a fine bird on the wing, and generally soars at some height. As it is resident throughout its range, it may possibly be found nesting in Ceylon. In the plains of India it breeds about Christmas time, making a large stick nest, lined with green leaves and placed on a rocky ledge or in a high tree. Two eggs are laid. The ground colour is dirty white faintly blotched at the large end with brown. Measurement about 2·75 by 2·2.

HIERAETUS PENNATUS (Blanford, Vol. III., p. 344).

NISAETUS PENNATUS (Legge, p. 36).

The Booted Eagle.

Description.—Adult : Forehead and lores whitish ; a narrow black streak above the eye : feathers of sides of head, crown, and hind-neck fawn colour with black shaft-streaks, which are broadest on the crown ; cheeks and ear coverts richer brown ; upper plumage brown, darkest on the upper back, rump, and large scapulars ; smaller scapulars, tertiaries, and wing coverts paler with dark shaft-stripes and broad whitish-brown edges ; wing quills almost black, the secondaries with pale ends ; upper tail coverts fawn colour ; tail feathers dark grayish-brown above, grayish-white underneath, with paler tips and traces of darker bars. The lower parts, including the wing lining, are buff-white with blackish shaft-stripes, which are most numerous on the chin, less so on the breast, and fade away on the abdomen ; a few large black spots on the wing lining.

* *Vide* Legge's Birds of Ceylon, p. 37 The locality and date are not known.

Some specimens are dark brown all over. In old birds there are faint rusty barrings on the thigh coverts and vent.

In young birds the head and neck are rufous-brown or dark brown; the upper plumage much as in adults, but with dark shaft-stripes; tail coverts paler: lower parts dark brown, or pale rufous, with dark shaft-stripes, except on the abdomen; upper surface of tail as in adults, but under surface pale brown instead of whitish-gray.

Bill pale blue at the base, blackish at the tip; iris pale brown; cere yellow; legs and feet yellow.

Male: length 20; wing 15; tail 8·5; tarsus 2·4; mid-toe without claw 1·60; bill from gape 1·4.

Females larger: length 22; wing 15·75.

Distribution.—An occasional visitor to the Island; specimens have been recorded from Colombo and Kandy. It is found, mainly as a winter visitor, throughout India, and occasionally in Burma. It also occurs in Southern Europe, South-western and Central Asia, and the greater part of Africa.

Habits, &c.—A bold and active little Eagle, which preys on squirrels, birds, &c., being very fond of poultry and pigeons. It may be found both in wooded country and about inhabited places. It generally breeds north of the Himalayas, but a nest has been found in Southern India. It is of the same description as the nest of the last species, and is placed in a tree. The two eggs are greenish-white, and measure about 2·13 by 1·78.

LOPHOTRIORCHIS KIENERI (Blanford, Vol. III., p. 345;
Legge, p. 42).

The Rufous-bellied Hawk Eagle.

Description.—Adult: Whole upper plumage and sides of head and neck glossy-black; wing quills black, tinged with brown; tail feathers dark brown with indistinct black bars; the underside of the wing and tail is gray with dark ends and bars. Chin, throat, and breast white; remainder of lower parts, including the wing lining, chestnut-red, streaked with bold black shaft-stripes.

Young birds are dark brown above, some of the feathers with paler edges ; tail barred ; lower parts pure white ; ear coverts rufous-brown streaked with black.

Bill black ; cere yellowish-white ; iris dark brown ; feet pale yellow.

Male : length 21 ; wing 15 ; tail 8·25 ; tarsus 2·8 ; middle toe without claw 2·15 ; bill from gape 1·5.

Females larger : length about 24 ; wing 16. Both male and female appear to vary in size.

Distribution.—A rare bird, but apparently resident in the hills, and occasionally seen in the low-country, as I recently obtained a specimen in forest 16 miles south-east of Puttalam. It is found in the Eastern Himalayas and the hill ranges of Eastern Bengal and Southern India. It also occurs in Malaya, but is nowhere common.

Habits, &c.—A fine bold bird with a graceful buoyant flight. It may be met with perched on tall trees in the forest, or seen sailing over wooded hillsides, patana gorges, &c. It feeds on small mammals and birds. It breeds regularly on the hills of Travancore in Southern India. The nest, which is used year after year, is a huge structure of sticks. The work of repairing it is begun in October or November. As early as December or as late as March a single egg is laid on a lining of green leaves. The colour is white, roughly speckled and dotted with pale reddish or yellowish-brown, sometimes with some deeper markings of blood red, and faint underlying blotches of gray. The texture is fairly smooth, but coarse-grained, and the inner lining of the shell is a fairly bright green. Average size about 2·29 by 1·83.

ICTINAETUS MALAYENSIS (Blanford, Vol. III., p. 347).

NEOPUS MALAYENSIS (Legge, p. 47).

The Black Eagle.

Description.—Adult : Brown-black almost all over ; lores whitish ; lower parts with a browner tinge ; the tail feathers and the inner webs of the wing quills near the base are barred with mottled-gray, which on the underside of the feathers appears whitish.

Young birds are browner, the head is almost tawny, especially on the sides. Some specimens have tawny spots

on the tips of the feathers of the crown, hind-neck, and sides of neck; also similar pale drops or broad shaft-stripes on the lower plumage. The change to the adult plumage is gradual.

Bill greenish-horny, the tip black; cere and gape citron-yellow; iris dark brown; legs gamboge-yellow.

Males: length 27; wing 21.5; tail 13; mid-toe without claw 1.60; bill from gape 2.

Females: length 31; wing 24; tail 14.

Distribution.—Found on the hills and in low-country forest tracts. It occurs in the Malay Peninsula and Archipelago, on the Western Himalayas and Western Ghats, on the hills south of Assam, and more rarely in Burma.

Habits, &c.—A graceful long-winged bird, usually seen sailing over forests with a flight rather like that of a Harrier. It is known to kill such large game as jungle fowl, but also feeds on lizards, grasshoppers, &c. Unlike most birds of prey, it does not require an open space in which to swoop on its quarry, but will seize it even in forest. It is, as a rule, a silent bird, but occasionally utters a shrill cry when soaring. The nest may be used for many years in succession, and is the usual large structure of sticks lined with green leaves and placed in a large tree.* Repairs start in October or November, and about Christmas time one or occasionally two eggs are laid. They vary a good deal in size, shape, and the character of their markings, but most specimens are extremely handsome. The ground colour is white or creamy, with large irregular blotches and specks of rich brown. In some specimens these markings are not so distinct, and the egg is more or less clouded with secondary markings of neutral tint or grayish-purple. Average size 2.45 by 1.95.

SPIZAETUS CIRRHATUS (Blanford, Vol. III., p. 349).

SPIZAETUS CRYLONENSIS (Legge, p. 55).

The Crested Hawk Eagle.

Description.—Adult: The whole head except the chin and throat, the sides of the neck, and the hind-neck tawny-brown,

* The statement in Blanford and in Humes' "Nests and Eggs" that this species builds in the ledges of cliffs appears to be erroneous (*vide* "Ibis," January, 1918, p. 51).

with dark centres to the feathers ; a long dark crest with conspicuous white tips ; back, scapulars, and wing coverts dark brown with pale edges ; rump and tail coverts smoky-brown with darker shafts ; wing quills smoky-brown above and whitish underneath, barred and tipped with black, the inner webs white towards the base ; the tail feathers are of the same smoky brown above and white beneath, with broad black crossbars and narrow white tips. The chin, throat, and under surface are white ; there is a narrow black streak down the centre of the throat ; the feathers of the breast and abdomen are splashed with bold brownish-black drop-shaped marks, which increase in size downwards. the flanks, vent, and under tail coverts being almost wholly brown ; the thighs and upper tarsus are rather more rufous, the lower tarsus is white. The edge of the wing and the wing lining are white with long drop-shaped marks of dark-brown.

Some mature birds appear to be much lighter and have no dark chin stripe. There are fewer dark drops on the breast, while the abdomen, thighs, and under tail coverts are white with patches of pale rufous-brown.

In young birds of the darker race the head and neck are lightish brown ; the feathers of the upper plumage have white edges, most conspicuous on the wing coverts ; the dark bars on the wings and tail are more numerous than in adults ; the lower parts are white or pale buff, with fewer dark drops ; the abdomen and thighs are lighter.

Young birds of the pale race have the upper plumage much mixed with white ; the head and neck are inconspicuously streaked with tawny buff, against which the dark crest shows boldly. The lower parts are of unspotted white shading into rufous on the abdomen ; the thighs and under tail coverts are barred with pale rufous.

Bill dark leaden, black at the tip ; cere yellow in young birds, leaden in adults ; iris pale straw to golden-yellow ; feet yellow.

Dimensions are rather variable ; males, as a rule, are smaller than females, and dark birds than light forms.

Length about 23·5 ; wing 14·5 ; tail 9·75 ; tarsus 3·6 ; mid-toe without claw 2 ; bill from gape 1·65.

Distribution.—Fairly common nearly all over the low-country, and in the hills up to about 4,000 feet. It is replaced in the higher ranges by the next species. In India it is practically confined to the peninsula south of the plain of the Ganges.

It is possible that the smaller darker birds are a local resident race, and the larger paler birds migrants from India.

Habits, &c.—A woodland species, usually met with on the edge of heavy jungle, in park country, or in chenas and scrub jungle through which larger trees are scattered. It rarely soars for any prolonged period, but is usually seen perched on the top of a high tree. It feeds mainly on lizards, but also kills small mammals and birds, and on occasions is very destructive to poultry. It breeds early in the year on tall trees, constructing a large nest of twigs lined with green leaves. The single egg is of dull greenish-white, either unspotted or faintly streaked at the larger end with reddish-brown. Measurement about 2·67 by 2·03.

SPIZAETUS KELAARTI (Blanford, Vol. III., p. 354 ;
Legge, p. 51).

Legge's Hawk Eagle.

Description.—Adult : Feathers of the head and hind-neck black with pale edges, which are broadest on the hind-neck ; the long crest black, tipped with white ; upper parts blackish-brown ; the scapular and upper tail coverts tipped with white ; wing coverts pale brown, darker at the ends ; wing quills brown above, pale gray below, with dark crossbars ; tail feathers smoky-brown above and gray below with dark crossbars and narrow white tips. Chin, throat, and fore-neck creamy-white, with a broad dark stripe down the centre and a less clearly-defined stripe down each side ; rest of lower parts, including the legs and tail coverts, pale brown with broad white crossbars ; the bars on the thighs are narrower ; tarsus pale brown with white tips to the feathers.

Young birds are paler. The head and neck feathers are tawny white with drop-shaped marks of rufous-brown ; there is a good deal of white on the wing coverts ; the sides of the

head and neck, the throat, and fore-neck are almost unmarked creamy-white ; the breast and abdomen are very pale brown with white crossbars.

Bill black, paler at the base ; cere blackish ; iris yellow ; feet lemon-yellow.

Females : length about 31 ; wing 18 ; tail 12·5 ; tarsus 4·5 ; mid-toe without claw 2·8 ; bill from gape 2.

Males are rather smaller.

Distribution.—Confined to the higher ranges of Ceylon and Southern India. In Ceylon it appears to reside at elevations of over 4,000 feet, though it may be met with at lower altitudes in search of food.

Habits, &c.—Rather a shy bird. It may be seen soaring slowly in wide circles above the higher ranges. It remains on the wing longer than the preceding species. It is fond of poultry, and most of the specimens obtained have been shot while raiding hen runs. The nest has frequently been found in the hills of Travancore. It is a huge structure of twigs lined with green leaves and placed in a tall tree. Unless the birds are driven away, it is used year after year. A single egg is laid generally in December. If the first egg is taken, a second may be laid later on. The shape is a broad oval, the small end well defined, but not pointed. The colour is white, at times with a few scattered markings of faint yellow or red. The texture is coarse, rough, and glossless. Average size 2·75 by 2·14.

Group II.—Serpent and Fish Eagles.

For the sake of convenience I have included the Serpent and Fish Eagles in one group, though they are not very closely akin, the main points of resemblance being their large size, powerful build, and longish tarsi. The Serpent Eagle—genus *Spilornis*—has a very distinctive plumage ; adults being brown above and below, with white rounded spots on the lower parts. The wing is short, but broad and rounded ; the bill is fairly long and stout, with only a trace of a festoon ; the lores are nearly naked ; the nape is covered with a thick bushy crest ; the tarsus is only moderately stout, is naked, except for a short distance in front, and is covered with small

polygonal scales ; the toes and claws are short, the latter are not very much curved. The two Fishing Eagles rival in size the largest of our Hawk Eagles. The plumage is a combination of white and gray or brown. The wing is long, broad, and rounded ; the bill is stout with a well-marked festoon ; the tarsi and feet are very stout and powerful, the former are feathered in front for about one-third of the length. In the genus *Haliaetus* the outer toe is not reversible, but it is partially reversible in the genus *Polioaetus*.

Rough Key to Group.

- A.—A thick bushy crest ; tarsus almost naked, and only moderately stout ; plumage brown, the lower parts with white rounded spots.

Spilornis cheela (Crested Serpent Eagle).

- B.—No crest ; tarsus very stout and powerful, feathered in front for about one-third length.

- (1) Claws grooved beneath.

Haliaetus leucogaster (White-bellied Sea Eagle).

- (2) Claws rounded beneath.

Polioaetus ichthyaetus (Large Gray-headed Fishing Eagle).

SPILORNIS CHEELA (Blanford, Vol. III., p. 35).

SPILORNIS SPILOGASTER (Legge, p. 61).

The Crested Serpent Eagle.

Description.—Adult : The feathers of the forehead, crown, crest, and hind-neck jet black with a very narrow tip of brown and a white base ; the lores naked, except for a few black bristles ; the cheeks and ear coverts grayish-black ; upper parts dark brown with a purplish gloss ; smaller wing coverts blackish with a few small white spots at the tip ; wing quills blackish with some white patches at the base of the inner webs and with three broad bars, which are smoky-brown above and whitish below ; basal half of tail smoky-brown, outer half blackish with a broad band of whitish brown and a pale tip. Lower parts earthy-brown, lighter in some birds

than in others, chin and throat rather grayer; the whole under surface from the breast down marked with roundish white spots, which are edged with darker brown; on the vent, thighs, and lower tail coverts these spots change to bars.

In young birds the crown and nape are white with black-brown ends and pale edges; the feathers of the upper parts are lighter at the base and have pale tips; the wing coverts are a good deal mixed with white; the pale bands on the wing quills and tail are more numerous; the breast bears traces of fulvous crossbars; the edge of the wing lining is white.

Bill lead colour, darker at the tip; cere and naked skin of face lemon-yellow; iris yellow; legs and feet dingy-yellow.

Males: length about 23; wing 15; tail 9.5; tarsus 3.25; mid-toe without claw 1.8; bill from gape 1.7

Females are a little larger: length 24; wing 15.5.

Distribution.—Fairly common all over the Island, but most abundant in the drier low-country forest tracts. Blanford unites in one species several races which range all over the Indian Empire, also south-east to Malaya, including the Archipelago, and eastwards to Japan.

Habits, &c.—A forest species, generally found on large trees by the banks of rivers and streams, and round village tanks. From such trees the birds watch for their prey, which consists mainly of snakes, lizards, and frogs. They may also be seen soaring, often at a considerable height, and may then be recognized by their loud whistling cry and by the numerous light bars on the wings and tail. The birds appear to breed from about March to May. The nest is a loose structure of twigs, scantily lined with green leaves, and placed in a tall tree. The eggs number one or two, and are dirty-white with rusty-red stains and blotches. They measure about 2.50 by 1.95.

Haliaetus leucogaster (Blanford, Vol. III., p. 368;
Legge, p. 67).

The White-bellied Sea Eagle.

Description.—Adult: The whole head, neck, and lower parts are white, the neck and breast generally marked with

narrow dark shaft-lines ; the back and wings are dark ash colour tinged with brown ; wing quills and base of tail blackish ; outer third of tail white.

In young birds the head, neck, and lower parts are pale tawny or rufous ; the breast is darker ; the upper plumage is brown, many of the feathers with pale edges ; the tail feathers are whitish with brown ends, which are narrowly tipped with white.

Bill dark leaden ; cere paler ; iris hazel-brown ; legs and feet whitish.

Male : length 27·50 : wing 22 ; tail 10 : tarsus 3·6 ; mid-toe without claw 2·3 ; bill from gape 2·25. Females are slightly larger.

Distribution.—Not uncommon round the coast, except from Chilaw to Galle, where it is local. It is also found on the large inland tanks. It occurs on the shores of the Indian Ocean, from Bombay to the Malay Archipelago, and ranges into Australasia.

Habits, &c.—The birds live in pairs and reside year after year in the same place, hunting along the coast, lagoons, or tanks in the vicinity of their eyrie. Their food consists mainly of fish, sea-snakes, crabs, &c., but they will also on occasion seize wounded wild birds or young chickens.

The nest is a huge structure of sticks in a large tree, and is used year after year. The breeding season is early in the year. Two eggs are generally laid on a lining of green leaves. They are dull white with a green inner texture, and measure about 2·85 by 2·10.

POLOAETUS ICHTHYAETUS (Blanford, Vol. III., p. 370 ;
Legge, p. 72).

The Large Gray-headed Fishing Eagle.

Description.—Forehead whitish ; the head, upper part of hind-neck, and throat ashy-gray ; crown and nape brownish ; back, wings, rump, upper tail coverts, and a broad band at the end of the tail dark brown ; breast and flanks rather lighter brown than the back ; abdomen and basal two-thirds of the tail pure white.

Young birds are lighter brown, the feathers with pale edges ; head light brown with pale shaft-lines ; fore-neck and breast with broad white shaft-stripes ; wing quills barred with smoky-brown above and whitish underneath ; the white upper surface of the tail much mottled.

Bill dark horny, bluish at the base ; cere lead colour ; iris clear yellow, at times mottled with brown, or tinged with red ; legs and feet whitish.

Males : length 24·5 ; wing 17·25 ; tail 9·75 ; tarsus 3·5 ; mid-toe without claw 2·3 ; bill from gape 1·85.

Females rather larger : length 27 ; wing 18.

Distribution.—Found mainly in the northern half of the Island on coastal lagoons and estuaries, or inland on rivers and village tanks. It occurs in India eastwards of Delhi and throughout Burma to Malaya and the Archipelago.

Habits, &c.—A pair of these birds may usually be seen on jungle-girt village tanks of any size in the northern and eastern forest tracts. It is also fairly common round well-wooded shores of lagoons and estuaries. It feeds largely on fish, for which it watches from a perch on a tall tree near the water, swooping out now and then for short flights, but seldom soaring or staying on the wing for any very long period. The cry is a deep resonant “ kyaw ” repeated several times. The birds are frequently noisy early in the morning long before it is light. The breeding season is about Christmas time. The nest is a huge platform of sticks in a large tree. Two eggs are laid, grayish-white in colour, and measuring about 2·68 by 2·09.

Group III.—Kites.

The Kites and their allies form a group distinguished by their long, pointed wings and distinctly short tarsi, which are feathered for about halfway down or a little more. The bill is moderate with a distinct festoon, less prominent in the true Kites—*Milvus*—than in the other genera. The toes and claws are shortish.

There are three Ceylon species, two of medium and one of small size. Each is placed in a separate genus. *Haliastur*—the Brahminy Kite—forms a connecting link between the Sea Eagles and the true Kites.

Rough Key to Group.

A.—Size medium ; length 19 or over.

- (1) Adult plumage maroon and white ; tail slightly rounded at the end.

Haliastur indus (Brahminy Kite).

- (2) Plumage streaky brown ; tail forked.

Milvus govinda (Pariah Kite).

B.—Size small ; length about 12·50.

Adult plumage black, white, and gray.

Elanus caeruleus (Black-winged Kite).

HALIASTUR INDUS (Blanford, Vol. III., p. 372 ;
Legge, p. 76).

The Brahminy Kite.

Description.—Adult : Head, neck, flanks, and lower parts to the centre of abdomen white with dark brown shaft-lines ; rest of plumage chestnut-maroon with the same dark shaft-lines, except on the tail ; primaries black, except on the basal portion of the inner webs ; the tip and the under surface of the tail whitish.

Young birds are very different ; the upper plumage is earthy-brown ; the feathers of the head and hind-neck with pale tawny tips ; the back feathers and wing coverts with pale margins ; primaries black ; secondaries and tail dark brown, Throat and breast brown with tawny shaft-stripes ; abdomen and lower tail coverts with dark shaft-lines.

In the next stage the head, neck, and breast feathers are pale brown with a rufous tinge, and have dark shaft-lines ; wing coverts mixed with white ; lower abdomen dull-rufous. From this the birds moult into the adult plumage.

Bill bluish-horn colour ; cere yellowish ; iris brown ; legs and feet greenish-yellow.

Male : length about 19 ; wing 14·75 ; tail 8·5 ; tarsus 2 ; middle-toe without claw 1·25 ; bill from gape 1·4.

Females are a trifle larger.

Distribution.—Found all round the coast, and abundant on the tanks in the northern and eastern forest tracts ; much

more local in the south of the Island and the Western Province, and only a straggler in the hills.

It occurs throughout the Indian Empire, except in the dry districts and hill forests. It ranges eastwards to China and south-east to the Malay Peninsula. Closely allied forms are met with in the Malay Archipelago and Australia.

Habits, &c.—This, with us, is the commonest species of the group, and takes the place of the true Kites in acting as a general scavenger of garbage. It is, however, seldom met with far from water, and its food consists largely of fish, frogs, and crabs. On the coast it is generally seen near towns, large villages, and fishing stations. Inland it is a familiar sight round tanks and over paddy fields. It is continually on the wing, soaring and wheeling at a considerable height. The cry is a peculiar, rather dreary squeal. The breeding season begins about Christmas, with apparently a second brood about June. The nest is a structure of twigs, somewhat larger than a crow's nest, and placed in much the same positions. The two or three eggs are grayish-white, generally scantily speckled or dotted with faded reddish-brown. They measure about 1.95 by 1.62.

MILVUS GOVINDA (Blanford, Vol. III., p. 374 ;
Legge, p. 80).

The Pariah Kite.

Description.—Adult : Head and neck slightly tawny-brown with dark shaft-stripes ; a patch of unstreaked brown on the ear coverts ; back a more uniform, deeper, and slightly glossy-brown ; the medium wing coverts lighter, with dark shaft-stripes ; wing quills the same colour as the back, except the longer primaries, which with their coverts are blackish ; the inner secondaries are paler, and bear traces of dark brown crossbars ; all the quills are mottled with whitish on the concealed parts of the inner webs ; tail brown above, whitish-brown below, with faint dark bars. The lower parts are paler brown than the back ; the chin whitish ; abdomen and lower tail coverts generally tinged with rufous ; the whole marked with dark shaft-stripes.

Young birds are much streaked with pale buff on the head and lower parts, while the feathers of the back, secondaries, and tail are tipped with whitish.

Bill black; cere pale greenish; iris brown; legs and feet yellow or greenish.

Males: length about 22·5; wing 17; tail 10·5; tarsus 2·1; middle toe without claw 1·5; bill from gape 1·6.

Females larger: length 23·5; wing 18.

Distribution.—Confined to the sea coast in the north, from near Mannar to Trincomalee. It is apparently a partial migrant, especially on the north-east coast. It abounds all over the Indian Empire. A closely allied species inhabits Malaya and Australia.

Habits, &c.—It is strange that a bird so common all over India has such a restricted range in Ceylon. With us it feeds on garbage and the leavings of the nets when the fishermen haul in their catch. It breeds in the north of Ceylon in the early part of the year. The nest is a loose mass of twigs mixed with old rags and grass and placed in a tree. Two eggs, occasionally three or four, are laid. The colour is pale greenish-white generally spotted and blotched with brown or reddish, but occasionally unmarked. Average size of eight Ceylon eggs 2·08 by 1·55.

ELANUS CÆRULEUS (Blanford, Vol. III., p. 379 :

Lodge, p. 85).

The Black-winged Kite.

Description.—Adult. Upper plumage ashy-gray, paler on the head; fore-neck, a streak above the eye, the sides of the head, and all the lower parts white; at times the fore-neck and flanks are tinged with pearl-gray; lores, eyebrow, median, and smaller wing coverts black; primary quills dark ash-gray above and blackish below; the central pair of tail feathers ash-gray, the rest white, tinged with gray on the outer webs.

In young birds the feathers of the upper parts are brownish-ashy with pale edges; the quills and tail feathers are tipped with white; the throat, chest, and breast are tinged with buff.

Bill black ; cere pale yellow ; iris in adults deep ruby-red, in young birds yellow ; legs and feet rich yellow.

Length about 12·50 ; wing 10·5 ; tail 5·25 ; tarsus 1·3 ; mid-toe without claw 1 ; bill from gape 1·1.

Distribution.—Fairly widely distributed over the Island, probably a partial migrant, as in some districts it is commoner during the north-east monsoon. It is found throughout the greater part of India and Burma, ranges over the whole of Africa, and occurs locally in Southern Europe and South-western Asia.

Habits, &c.—This handsome little species avoids heavy forest, and is partial to grassy lands, patanas, young plantations, and low chenas, provided they are thinly dotted over with large trees. It is a solitary bird, and nowhere abundant. It is most noticeable during the north-east monsoon, but undoubtedly breeds in the Island. On the wing it rather resembles a gull in appearance. It seldom soars or takes long flights, but frequently hovers like a kestrel. Its food consists of insects, mice, small lizards, &c. In the hills the breeding season appears to be from December to March. In the low-country I once saw a bird in the Tangalla district beginning to build in July. The nest is like that of a crow, and is placed generally high up in a solitary tree. The eggs number two or three, and are almost perfect ovals. The ground colour is dull white, more or less densely blotched with brownish-red. Average size 1·55 by 1·20.

Group IV.—Harriers.

The Harriers belong to a single large genus, various members of which are found in most tropical and temperate climates. Four species, all of which are migratory, occur in Ceylon. They are easily recognized by their appearance and flight. The form is slender ; the beak is small, curves regularly from the base, and has a very slight festoon. There is a ruff of small soft feathers across the throat and up the sides of the neck to behind the ear coverts. The tail is long and even at the tip, or slightly rounded. The wings are long and pointed. The tarsus is long and slender, and is feathered in front only

at the base. The naked portion is covered in front with transverse plates, and behind with smaller polygonal scales. The toes are moderate, the claws slim, curved, and sharp.

In their habits all the species are very similar. They are generally seen flying over marshes or open grassy lands with heavy flaps of the wings, beating up and down for their prey, which consists largely of frogs, reptiles, insects, and small mammals. They are somewhat crepuscular, and generally perch and roost on or near the ground. In many species the male and female have a very different plumage, and the best way to identify the various forms is by the "notch" or indentation in the outer web of the larger primaries. This "notching" is characteristic of the larger wing quills in most birds of prey. From the base to this wavy indentation the barbs of the quill are set at an angle of about 45° to the shaft. From the "notch" to the tip the barbs, though no shorter in length, are set at a much more acute angle, thus considerably reducing the width of the web.

Rough Key to Species.

A.—Outer web of second, third, and fourth quills notched ; fifth quill not notched.

- (1) Tarsus over 2.5 in length ; notch on second quill close to tip of greater coverts.

Circus macrurus (Pale Harrier).

- (2) Tarsus under 2.5 ; notch on second quill about an inch beyond tip of greater coverts.

C. cineraceus (Montagu's Harrier).

B.—Outer web of second to fifth quills notched.

- (1) Wing under 15 in length.

C. melanoleucus (Pied Harrier).

- (2) Wing 16 or over.

C. xeruginosus (Marsh Harrier).

CIRCUS MAORUBUS (Blanford, Vol. III., p. 381 ;
Legge, p. 17).

The Pale Harrier.

Description.—Male : Upper surface pale bluish-gray ; except in very old birds, the nape and mantle are tinged with brown ; lores and all round the eye white ; ear coverts pale gray, streaked with white ; primaries ash-gray, second to sixth quills blackish-brown towards the ends, the bases of all the quills white ; upper tail coverts darker gray barred with white ; central tail feathers gray, outer feathers white with irregular gray bars. Lower parts white, with a gray tinge on throat, neck, and breast.

Female : Upper surface brown ; feathers of head and hind-neck with pale rufous margins ; forehead, eyebrow, and a patch below the eye buffy-white ; ear coverts and a broad moustache-stripe brown ; a well-marked ruff of white, or buff, with brown shaft-stripes runs right round the neck ; smaller wing coverts with tawny edges ; wing quills smoke-brown above, whitish underneath, with ends and broad bars of black-brown ; upper tail coverts white, with brown shaft-stripes ; central tail feathers smoke-brown, outer feathers tawny, all with dark brown bands. Lower parts white with rufous shaft-stripes which are broadest on the breast. In old birds these stripes become very narrow.

Young birds resemble females in their upper plumage, but the feathers have tawny margins, the ruff is pale tawny all round the neck and stands out very conspicuously. The upper tail coverts are white and the lower parts buff with faint shaft-stripes. The adult plumage is assumed gradually.

Bill blue-black ; cere greenish-yellow ; iris yellow in adults, brown in young ; legs yellow.

Males : length 18 ; wing 13·5 ; tail 9·25 ; tarsus 2·7 ; mid-toe without claw 1·25 ; bill from gape 1·10.

Females rather larger : length 19·5 ; wing 14·5.

Distribution.—Fairly common throughout the Island during the north-east monsoon. A few stray and probably immature specimens remain with us all the year round, chiefly

up-country. The species ranges over Eastern Europe, and practically the whole of Asia and Africa, breeding in the north and wintering in the south.

Habits, &c.—All our Harriers have much the same habits, which are described in my remarks on the group. The present species frequents swamps, paddy fields, and stretches of grass land near water. At times large numbers of these birds and the next species congregate and roost in some favourite spot in a swamp. It does not appear to breed in the Island.

CIRCUS CINERACEUS (Blanford, Vol. III., p. 383 ;

Legge, p. 12).

Montagu's Harrier.

Description.—Male : Head, neck, breast, and upper plumage dark ash-gray, with a bluish tinge ; back, scapulars, and tertiaries, except in old birds, tinged with brown ; upper tail coverts white at the base, ashy-gray at the ends, and sometimes with bands of the same colour ; first six primaries almost black with slight gray tips, which increase in size on the inner primaries ; secondaries gray with two black cross bands ; middle tail feathers unbarred frosted gray, remainder whitish with bars of dusky gray, which become rufous brown on the outermost feathers. Abdomen, under tail coverts, and thighs whitish with rufous shaft-stripes ; wing lining white with a few chestnut patches.

Females resemble those of the preceding species, only the ruff is not so distinct, the upper parts are darker, and the lower parts are dull rufous, or buff, with rufous brown shaft-stripes.

In young birds the ruff is streaked, and is less distinct than the conspicuous, clear-coloured ruff of the young Pale Harrier. At all stages the present species may be distinguished by the characters noted in the key.

Bill black ; cere greenish-yellow ; iris yellow in the male, brownish-yellow in the female ; legs and feet yellow.

Male : length 17 ; wing 14·75 ; tail 9 ; tarsus 2·25 ; mid-toe without claw 1·1 ; bill from gape 1·05.

Females larger : length 19 ; wing 15·25

Distribution.—Appears in considerable numbers in the north of the Island during the north-east monsoon and spreads down the coast on both sides. It is not so common in the interior as the last species. In winter it is met with locally throughout India, but is very rare in Burma. It occurs over the greater part of Europe, Asia, and Africa.

Habits, &c.—Much the same as those of other Harriers. It is largely crepuscular, and appears to be rather dazzled in broad daylight. It haunts swamps, marshes, and open country, and feeds mainly on frogs and lizards. It does not appear to breed south of the Himalayas.

CIRCUS MELANOLEUCUS (Blanford, Vol. III., p. 385 ;
Legge, p. 9).

The Pied Harrier.

Description.—Male : Head, neck, breast, back, and median wing coverts black, glossy above, but duller on the breast ; smaller wing coverts almost white ; the first six primaries and the tertiaries black, remainder of wing quills silver-gray, the secondaries with tips and inside borders of white ; rump white ; upper tail coverts white shaded with gray towards the ends ; tail feathers gray, the outer feathers paler, and with a considerable amount of white on the inner web ; lower parts from breast downwards clear white.

Female : Upper plumage dark brown ; the feathers of the crown and neck edged with rufous ; nape feathers with broad white borders and bases ; a distinct ruff of small whitish feathers with dark brown shaft-stripes ; cheeks and ear coverts dirty-white, streaked with brown ; the smaller wing coverts along the bend of the wing white with brown streaks ; greater wing coverts and secondaries with broad brown bands ; primaries blackish-brown ; upper tail coverts white with some rufous markings ; tail smoky-gray with brown bands. The lower parts from the ruff downwards white with brown stripes, which are very broad on the neck and breast, but narrower and tending to disappear on the abdomen.

Young birds are like females, but are more uniformly brown above and have no gray on the wings and tail, which are

brown with darker bands, while the lower parts are rufous brown with slightly darker streaks.

Bill black, bluish at the gape : cere greenish-yellow ; iris bright yellow ; legs yellow.

Male : length 17·5 ; wing 14 ; tail 8·5 ; tarsus 3·1 ; mid-toe without claw 1·3 ; bill from gape 1·10.

Females are larger : length 18·5 ; wing 14·5.

Distribution.—A rare migrant during the north-east monsoon, recorded from a few localities on the coast, also from Ratnapura and the North-Western Province. It occurs in Burma and the eastern half of India during the winter, and ranges throughout Eastern Asia, breeding mainly in the north.

Habits, &c.—Found quartering over grassy jungles as well as over paddy fields and swamps. It has been found breeding in Northern India, but is not likely to nest in Ceylon.

CIRCUS ÆRUGINOSUS (Blanford, Vol. III., p. 387 :

Legge, p. 5).

The Marsh Harrier.

Description.—Adult : Head and neck buff, or rufous, with dark brown shaft-stripes ; the back, with the smaller and median wing coverts, and at times the tertiaries, dark brown, some of the feathers tipped with rufous ; the lesser coverts along the bend of the wing are buff with dark shaft-stripes : the first six primaries blackish, the remaining wing quills and the greater wing coverts silver-gray ; the concealed basal portion of all wing quills white ; upper tail coverts white, mixed with gray and rufous-brown ; tail pale gray. The breast is buff with broad brown shaft-stripes ; abdomen and lower tail coverts rather streaky rufous-brown.

In immature birds the plumage is mainly dark brown ; the crown, nape, and chin buff with narrow brown stripes ; the tail coverts, wing coverts, back, and lower parts may have rufous tips to the feathers. In some cases the bird is dark brown all over. The adult plumage is gradually assumed.

Bill black ; cere greenish-yellow ; iris yellow, brownish in young birds ; legs and feet yellow.

Length 21 ; wing 16 ; tail 9·5 ; tarsus about 3·4 ; mid-toe without claw 1·75 ; bill from gape 1·35. Females are generally slightly larger.

Distribution.—A migrant visiting the Island in fair numbers during the north-east monsoon ; more plentiful in some years than in others, and always rather locally distributed, mainly round the coastal swamps and lagoons. It occurs in winter in suitable localities throughout India and Burma, and its range extends over most of the Old World.

Habits, &c.—It frequents marshes, paddy fields, and sometimes dry grass lands. It lives on frogs, fish, and insects, but, being a far more powerful species than our other Harriers, it can also tackle birds, and will occasionally carry off a wounded snipe or teal. A few birds breed in India, so a stray nest may, perhaps, be found in Ceylon. The nest is made of straw or grass placed among reeds or on the ground. The four or five eggs are white, at times slightly spotted with bright reddish-brown. Size about 2 by 1·50.

Group V. — Buzzards.

The Buzzards, structurally, are closely allied to the Eagles, differing from them mainly in their less powerful beaks and claws, and in their partially naked tarsi. Another distinctive characteristic is that, though the colouration varies enormously in different specimens, there is no distinct immature plumage.

Only one species occurs in Ceylon, and that species as an exceedingly rare straggler. It is of about the same size and general colour as an immature Brahminy Kite, but may be distinguished by the tarsus, which is about twice as long as the measurement in a straight line from the gape to the tip of the bill, and is feathered in front to halfway down or more ; the naked portion both in front and behind is covered mainly by transverse plates. The bill is moderate, and curves from the cere, the festoon is but slight. The wings are ample, long, and pointed ; the tail is moderately long and rounded at the end ; the toes are short.

BUTEO DESERTORUM (Blanford, Vol. III., p. 393).

BUTEO PLUMIPES (Legge, p. 31).

The Common Buzzard.

Description.—Colour variable, either dark or pale brown, with more or less noticeable shaft-streaks ; the feathers of the crown, nape, and hind-neck with white bases ; sides of the neck whitish with dark brown streaks, including a dark moustache-stripe and a band running backwards from the eye ; the primaries have black-brown ends, a large portion of the inner web is white, the under surface of the quills is also white, except at the tip ; secondaries brown above, with the inner webs partly white or rufous, underneath whitish with dark gray ends and cross bands ; tail brown or rufous above, whitish below, with more or less distinct bars. Lower parts white or buff, the throat streaked with brown, the breast and abdomen also broadly streaked, or at times almost covered with brown.

Some birds are brown almost throughout.

Bill black, bluish-gray at the base ; cere yellow ; iris brown ; legs and feet yellow.

Females : length about 20 ; wing 15 ; tail 8-9 ; tarsus about 2·8, but rather variable ; mid-toe without claw 1·5 ; bill from gape 1·40. Males smaller ; wing about 14.

Distribution.—An extremely rare straggler to the Island, only recorded twice or thrice. It occurs throughout the greater part of Europe, Asia, and Africa, and is resident in the Himalayas, visiting the peninsula of India in the winter.

Habits, &c.—Rather like those of a Harrier. It quarters over marshes and bare lands hunting for mice, frogs, lizards, and insects. It is rather sluggish and solitary, and during the heat of the day generally perches on a low tree or bush, or on the ground.

Group VI.—Hawks.

The three typical Hawks found in Ceylon are all of small size. They are to be met with mainly in forest or in well-wooded localities. As a group they are distinguished by their short, rounded wings and long tarsi. The bill is short and

stout, and curves sharply from the cere ; the festoon is well marked. The tarsus is feathered in front only at the base ; the naked portion is covered in front and behind with transverse shields, and on the sides with reticulated scales. The tail is fairly long and square at the ends. The lower plumage is transversely barred in adults and spotted in the young. The females in all three species are much larger than the males.

Rough Key to Group.

A.—Tarsus fairly stout ; toes moderate ; bill from gape about three-fifths of mid-toe without claw.

(1) No crest ; wing up to 7·5 ; central tail feathers in adults not completely barred.

Astur badius (The Shikra).

(2) A small crest ; wing 7·5 or over ; central tail feathers in adults fully barred.

Lophospizias trivirgatus (Crested Goshawk).

B.—Tarsus slender ; toes long ; bill from gape half mid-toe without claw.

Accipiter virgatus (Besra Sparrow Hawk).

ASTUR BADIUS (Blanford, Vol. III., p. 398 ; Legge, p 23).

The Shikra.

Description.—Adult male : Upper plumage bluish-ashy ; the hind-neck generally tinged with rufous ; wing quills blackish towards the ends, the inner webs below the notch white, or buff, with blackish bars ; in the tail the middle and outermost feathers are not barred, or have only traces of bars, the remainder have four or five broad dark bars. The sides of the head and neck and a narrow streak down the chin are ashy-gray ; chin and throat otherwise whitish ; breast some shade of rufous with narrow white bars, which vary considerably in regularity and distinctness ; on the abdomen the colour gradually fades into the buff or white of the vent, thighs, and tail coverts.

Females are darker and browner above, and more boldly barred on the under surface.

Young birds are brown above, with rufous edges to the feathers ; all the tail feathers are barred, the bars on the outer feathers being narrower and more numerous ; lower parts white with large brown drop-shaped markings, which are largest on the breast ; there is generally a brown stripe down the centre of the throat.

Bill bluish. darker at the tip ; cere greenish-yellow ; iris yellow or orange, darkening to red in old birds ; legs and feet yellow.

Females : length 13·50 ; wing 7·5 ; tail 6·5 ; tarsus 2 ; mid-toe without claw 1·25 ; bill from gape ·75.

Males are smaller : length about 12 ; wing 6·75.

Distribution.—Found all over the Island in considerable numbers. It occurs throughout India and Burma, extending westwards into Southern Persia and eastwards as far as China.

Habits, &c.—May be seen almost anywhere, except in thick forest. According to Legge, it is a partial migrant, the majority of the birds seen near the sea during the north-east monsoon retiring inland to breed during the south-west. It feeds largely on lizards, but will also take small birds, rats, mice, grasshoppers, &c. The call is a two-syllabled whistle. The breeding season appears to last from April till about August. The nest is rather a loose structure of twigs, about a foot across, and lined with grass. It is generally placed near the top of a tree. The three eggs are plain bluish-white ; the texture is smooth, but glossless. Average size 1·55 by 1·22.

LOPHOSPIZIAS TRIVIRGATUS (Blanford, Vol. III., p. 401).

ASTUR TRIVIRGATUS (Legge, p. 20).

The Crested Goshawk.

Description.—Adult : Forehead, crown, and short crest blackish, shading into ashy on the sides of the head and neck, the shafts of the feathers darker ; upper parts from nape to tail coverts dark glossy-brown ; upper tail coverts tipped with white ; wing quills with blackish bars, much more distinct on the underside of the feathers than above ; tail smoky-brown with four broad blackish bands. Chin and throat white with

a long black stripe down the centre and one on each side on the border of the gray cheek ; breast rufous brown with white margins, which vary in width ; abdomen and thighs barred chocolate-brown and white, the bars becoming narrower on the thighs ; under tail coverts white ; wing lining whitish with brown patches.

Young birds are brown above with pale edges to the feathers and buff bases which show on the nape and hind-neck : under parts whitish-buff with traces of black stripes on the throat, some deep rusty spots on the flanks and abdomen and some brown bars on the thighs.

Bill bluish-brown at the base, black at the tip ; cere, eyelids, and gape of bill greenish-yellow ; iris golden-yellow ; legs and feet pale yellow.

Females : length about 15·5 ; wing 8 ; tail 7 ; tarsus 2·25 ; mid-toe without claw 1·25 ; bill from gape 1·1.

Males are smaller : length about 14 ; wing 7·5.

Distribution.—Not very common, but fairly widely distributed in the forests of the low-country and up to about 3,500 feet in the hills. It is found in similar country throughout India, Burma, and South-eastern Asia, including the islands from the Malay Archipelago to the Philippines. Himalayan birds are much larger than our Ceylon form.

Habits, &c.—Entirely a forest bird, generally seen in tall trees. The cry is a shrill note of one syllable. It feeds chiefly on lizards, but also on small birds.

The breeding season in Ceylon is probably during the south-west monsoon. The nest is rather like that of the preceding species, and is placed in a high tree. The two eggs are pale greenish-white, and measure about 2 by 1·4.

ACCIPITER VIRGATUS (Blanford, Vol. III., p. 404 ;
Legge, p. 26).

The Besra Sparrow Hawk.

Description.—Adult male : Head, hind-neck, back, and wings very dark ash colour, deepest on the head ; the back often tinged with brown ; the feathers on the nape and the scapulars white at the base ; wing quills brownish-gray above,

whitish below, with broad dark crossbars (the fourth quill has seven or eight such bars, including the tip) ; secondaries and tertiaries barred on the inner web with white ; tail dark ash-gray above, whitish below, with four dark bands on the inner feathers and five or six on the outermost ; the latter disappear in old birds. Throat white, generally with a dark stripe down the middle ; upper breast rufous, the central feathers with white edges and dark shafts ; lower breast, abdomen, and thighs barred white and rufous brown, but the breast and flanks are so tinged with rufous as to conceal the bars ; vent and lower tail coverts white.

Females are dark brown above ; the crown and nape blackish ; wings and tail browner than in males ; throat and fore-neck white with a broad dark central stripe ; the centre of the chest boldly striped with dark brown ; sides of chest, breast, abdomen, and thigh coverts banded rufous brown and white, the white bands growing narrower in old birds.

Young birds are brown above with rufous margins to the feathers ; the under parts are buff or brownish-white, with a broad dark band down the centre of the throat, and large brown spots on the breast, abdomen, and thigh coverts. The spots turn to bars as the birds grow older.

Bill lead-gray, blackish at the tip ; cere pale lemon-yellow ; iris bright yellow, orange in old birds ; legs and feet yellow.

Males : length about 10·5 ; wing 6·25 ; tail 5 ; tarsus 2 ; mid-toe without claw 1·25 ; bill from gape ·62.

Females considerably larger : length about 13·5 ; wing 7·5 ; mid-toe 1·4 ; bill from gape ·7.

Distribution.—Blanford unites under one head (1) *A. affinis*, a large form resident from the Himalayas to the Shan States, Siam, and possibly Malaya ; and (2) *A. virgatus*, of which the typical sub-species *A. virgatus virgatus* occurs as a resident in Southern India and Ceylon. It is fairly widely distributed over the Island wherever there is jungle.

Habits, &c.—Like the Crested Goshawk, this is a jungle bird and rather shy. The cry is a loud shrill squeal. It feeds on small birds, lizards, &c.

The breeding season appears to be about May ; the nest is a rough structure of twigs placed in a tree. The clutch varies

from two to four, three being the usual number of eggs. The eggs are white, tinged with a faint bluish tinge when fresh, and more or less brightly marked with blotches of reddish-brown. Average size 1·46 by 1·18.

Note.—*Accipiter nisus*—The Sparrow Hawk—may possibly occur in the Island. Kolaart in his *Prodromus* (p. 96) states that he saw a single live specimen. Legge (p. 29, footnote) shows that the authenticity of this record is doubtful. The species, however, is a winter migrant as far south as the Nilgiris, and may possibly turn up one day in the Ceylon hills.

It is a larger bird than the Besra Sparrow Hawk; males measuring about 8 and females 9·5 in the wing. It may be recognized by the fourth primary quill, which in adults has only five or six dark bars, and by the lack of the dark throat-stripe, which is generally present in *Accipiter virgatus*.

Group VII.—Honey Buzzards.

The Honey Buzzards differ from all other Birds of Prey by having the sides of the head, the lores, and even the eyelids covered with close overlapping scale-like feathers. As the birds feed largely on the combs and larvæ of bees and wasps, the close feathering of the head is doubtless a protection against the stings of these insects. The bill is weak, rather long, not very hooked, and has little or no festoon. The wings are long and rather rounded. The tail is moderate in length. The tarsus is short and feathered halfway down in front. The toes are long, the middle toe being as long as the tarsus, and are covered with conspicuous bony scales. Honey Buzzards are found throughout most parts of the Old World. One species occurs throughout the Indian Empire.

PERNIS CRISTATUS (Blanford, Vol. III., p. 406).

PERNIS PTILONORHYNCHUS (Legge, p. 89).

The Crested Honey Buzzard.

Description.—Plumage extremely variable. A fairly typical specimen is coloured as follows:—Forehead and crown iron-gray, deepening on the back of the head to light brown, with dark shaft-stripes; the small crest is black; nape and sides

of neck light brown with dark shaft-stripes ; back and rump sepia-brown ; upper tail coverts lighter brown with some white bars ; wing coverts brown, lighter at the tip ; primaries gray-brown with black tips and two black bars ; secondaries grayer with light tips ; innermost quills almost tawny-brown : tail brownish-black with a broad band of gray-brown on the outer half and a similar narrower band towards the base. Lores, sides of head, ear coverts, eyelids, and chin gray ; throat tawny-brown with darker shaft-stripes : a faint black streak down the centre of the throat and on each side ; rest of lower parts, with the wing lining, brown, more or less mottled with white ; under surface of wing and tail grayish-white with black bars.

Some, probably quite old birds, are darker, and have the throat and whole under surface chocolate-brown.

Young birds are much lighter. The feathers of the crown and nape and sometimes of the whole head and neck are pale tawny with dark shaft-stripes and white bases ; the rest of the upper parts are brown with pale edges to the feathers. the wing coverts and upper tail coverts are a good deal mixed with white ; wing quills and tail brown, narrowly tipped with white and irregularly barred and mottled with lighter grayish-brown. The lower parts are white, or buff, more or less marked with long dark shaft-stripes, which are sometimes drop-shaped.

Mature birds may be told by the tail. In the adult stage the broad pale cross band, though it may be mottled, is never barred as in younger birds.

Bill black, whitish-blue at the gape ; cere hard and horny, and of a deep lead colour : iris golden or brownish-yellow ; legs and feet yellow.

Females : length about 26 ; wing 16·5 ; tail 10·5 ; tarsus 2 ; mid-toe without claw 2 ; bill from gape 1·65.

Males : length about 25 ; wing 16.

Distribution.—Found during the north-east monsoon, mainly in the northern half of the Island. Some birds appear to be resident. It occurs throughout the Indian Empire and South-eastern Asia.

Habits, &c..—Generally seen near water and in well-wooded country, but on its first arrival it may be met with near the coast. The flight is straight and rather hurried, but seldom long-sustained. It feeds largely on the combs of bees, eating both honey and brood-comb. It will also eat white ants, various insects, and small reptiles. Some birds may breed in the northern forest tract, probably during the south-west monsoon. Indian nests are the usual structure of twigs placed in a tree. One or two eggs are laid. They are white or buff mottled and blotched with blood red or reddish, and measure about 2·03 by 1·72.

Group VIII. —Bazas.

The Bazas form a genus which differs from all the preceding groups, in having the upper mandible of the bill furnished with two saw-like teeth on each side, just opposite the end of the lower mandible. In young birds there is often but one tooth, as in the Falcons, but whereas in the present genus the nostril is an oblique slit, in the Falcons it is a circular opening. There is a long crest on the crown. The wings are only moderate in length, and the first primary is much shorter than the fourth. The tail is fairly long and square at the ends. The tarsus is short and feathered halfway down in front; the toes are fairly long.

Bazas are forest birds, of smallish or medium size, found in Africa, Madagascar, the Oriental region, and part of Australia. Two rare species occur in Ceylon.

Rough Key to Species.

A.—Plumage mainly black; length about 13.

Baza lophotes (Black-crested Baza).

B.—Plumage mainly brown; length about 17.

Baza ceylonensis (Legge's Baza).

BAZA LOPHOTES (Blanford, Vol. III., p. 409;

Legge, p. 98).

The Black-crested Baza.

Description..—Adult: General colour of upper plumage, wings, and tail black with a slight grayish bloom; the bases of all body feathers white; the longer scapulars white with broad margins of black washed with ferruginous red; the

exposed portions of the longer wing coverts and the last few wing quills largely white, irregularly pied with black and ferruginous red; the outer webs of the inner primaries and some secondaries washed with reddish-chestnut; wing lining black, the greater under coverts and the under surface of wing quills and tail ashy-white, darkening to blackish towards the tips of the wing quills, and with blackish patches towards the end of the tail feathers.

Chin and throat black; a broad white gorget on the lower fore-neck; below this is an indefinite black band tinged with chestnut; breast and long flank plumes whitish-buff, banded with chestnut; abdomen, thighs, and lower tail coverts grayish-black, the abdomen fringed with pale reddish-white, and the tail coverts with whitish.

Young birds have the ferruginous and white markings on the scapulars and quills more developed, the black of the plumage is duller, and the red banding on the flank is fainter or wanting.

Bill, in a fresh specimen, pale grayish-blue, black at the tip; cere, legs, and feet pale grayish-blue; iris purple-brown.

Males: length 13; wing 9.25; tail 5.25; tarsus 1.1; mid-toe without claw 1.1; bill from gape 1.

Females slightly larger; wing 9.9.

Distribution.—A rare bird, which appears to have its headquarters at the base of the Himalayas, from Nepal eastwards. It also ranges through Burma to Cochin-China and the Malay Peninsula. In Ceylon it is a rare migrant during the north-east monsoon. Specimens have been recorded from various widely-scattered localities in the low-country.

Habits, &c.—This species may be found in fairly wild jungle or forest, generally at no great elevation. It occasionally goes about in little troops, and is said to feed mainly on insects. The cry is sharp and Kite-like.

BAZA CRYLONENSIS (Blanford, Vol. III., p. 409;

Legge, p. 94).

Legge's Baza.

Description.—Adult: Feathers of crown and nape dark brown, deepening to black on the shafts and towards the end.

and with pale margins ; the long crest blackish with white tips ; the feathers from the hind-neck to the rump earthy brown with narrow pale tips ; greater secondary coverts and tertiaries rather paler and with more white ; primaries, secondaries, and tail smoky-brown above, grayish-white below, with darker brown bars ; the inner primaries, the secondaries, and outer tail feathers with narrow white tips. The lores and a stripe behind the eye blackish-brown ; cheeks and ear coverts gray with dark shaft-stripes ; chin and throat buff, also with dark shafts ; the sides of the neck and of the breast more tawny ; rest of lower surface white with broad crossbars of pale rust colour, which are less conspicuous on the under tail coverts.

Young birds are paler ; the dark bars on the tail are five in number, as against four in adults ; the lower surface is whiter, and the rusty cross bands are paler and less perfect.

Bill blackish lead colour ; cere brownish-black ; iris orange-yellow ; legs and feet yellowish.

Length about 17 ; wing 12 ; tail 8 ; tarsus 1·5 ; mid-toe without claw 1·5 ; bill from gape 1·25.

Distribution.—An extremely rare resident in the hills. It has also been obtained in India in the Wynaad. It is, perhaps, only a sub-species of *B. jerdoni*, which occurs in Sikkhim, Tonasserim, the Malay Peninsula, and Sumatra.

Habits, &c.—Little is known of its habits. It occurs on wooded hill slopes and in the jungles scattered over the patanas. The nidification is as yet unknown, but probably its nesting habits resemble those of *B. lophotes*, which makes a nest like that of a small Kite in a high tree and lays three chalky white eggs.

Group IX.—Falcons.

The Falcons and their allies are a world-wide group noted for their speed and courage. Many of the species have long been trained by Falconers.

The typical Falcons prey on birds, swooping down on their quarry while in flight, and killing it with a powerful ripping stroke of the hind claw. Kestrels, however, hover over the ground hunting for small mammals, upon which they drop

quietly from above. The members of the group vary from medium to small size. They are all neatly built with long pointed wings. The second quill may be the longest, as in the genera *Falco* and *Erythropus*, or the second and third quills may be almost equal, thus giving the wing a slightly more rounded appearance, as in *Asalon* and *Tinnunculus*. The bill is stout, shortish, and well hooked, with one conspicuous tooth on each side of the upper mandible, and with more or less of a festoon further back. The nostril is circular with a central tubercle. The tarsus is fairly short, with the upper half plumed in front; the toes are long; the claws curved and sharp. The tail is of moderate length, and is slightly rounded in all our genera, except the Kestrel, in which it is more fan-shaped, the outer tail feathers being markedly shorter than the central pair.

Rough Key to Group.

A.—Second primary longest; first primary much longer than fourth.

(a) Sexes similar; legs yellow. Genus *Falco*.

(1) Length 16·19; crown dark gray; breast only slightly rufous.

F. peregrinus (Peregrine Falcon).

(2) Length 15–18; crown blackish; breast generally dark rufous.

F. peregrinator (Shahin Falcon).

(3) Length 10·5–11·5.

F. severus (Indian Hobby).

(b) Sexes dissimilar; legs deep orange-red; length about 12.

Erythropus amurensis (Eastern Red-legged Falcon).

B.—Second and third primaries longest; first primary about equal to fourth.

(1) Tail only slightly rounded.

Asalon chicquera (Red-headed Merlin).

(2) Tail graduated, outer feathers distinctly shorter than inner pair.

Tinnunculus alaudarius (Kestrel).

FALCO PEREGRINUS (Blanford Vol. III., p. 413 ;
Legge. p. 101).

The Peregrine Falcon.

Description.—Adult : Above blue-gray with dark shaft-stripes and bars, the rump and upper tail coverts paler ; hind-neck, upper part of mantle, and wing coverts largely dusky ; forehead whitish ; there is a black moustache band, which expands into a patch on the cheeks and ear coverts ; primary quills brown-black, the inner webs barred with white or pale rufous, except near the tip ; secondaries ash-gray with indistinct darker crossbars ; tail dusky gray, with many ash-gray crossbars and a whitish tip. Lower parts white tinged with rufous ; lower breast and centre of abdomen with a few brown or black spots and bars ; flanks, wing lining, thigh coverts, and under tail coverts with more regular narrow black bars.

Young : Above dark brown with rufous edges to the feathers ; the white bases of the feathers are exposed on the nape ; the tail feathers have pale rufous oval spots ; the black cheek-stripe is narrower than in adults ; lower parts white tinged with buff or rufous and with long fairly wide dark brown shaft-stripes ; wings as in adults. The slaty-gray back of the adult is gradually attained, while the dark markings on the breast slowly become smaller, and in old birds practically disappear, save for a few specks on the abdomen and three-cornered marks on the thighs.

Bill bluish, black at the tip ; cere and orbital skin yellow ; iris brown ; legs and feet yellow.

Females : length about 19 ; wing 14·5 ; tail 7·5 ; tarsus 2·2 ; mid-toe without claw 2·25 ; bill from gape 1·35.

Males are smaller : length about 16 ; wing 12·5.

Distribution.—A very rare migrant during the north-east monsoon, keeping mainly to the coast, but specimens have been met with inland as far as the bases of the main central hill ranges. It is found all over the world, breeding in the north and visiting the tropics in winter.

Habits, &c.—This species in Ceylon generally frequents cliffs and marshes near the sea, preying largely on Wild-fowl and

aders. From its bold nature, its swift flight, and powerful stroke it has long been a favourite with Falconers, who train it to fly at Herons, Storks, Cranes, &c. Though usually breeding in the far north, there seems no doubt (*vide Legge, p. 104*) that Layard shot a pair breeding in the Jaffna peninsula. The nest was a rough structure of twigs in the top of a palmyra. In temperate regions the nest is usually placed on a cliff ledge. The three or four eggs are reddish-white, freckled with brick-red or reddish-brown, and measure about 2·2 by 1·65.

FALCO PEREGRINATOR (Blanford, Vol. III., p. 415 ;
Legge, p. 106).

The Shahin Falcon.

Description.--Darker than the last species ; at all ages the head, nape, and hind-neck are almost charcoal-black, and the lower surface from the chest to the tail coverts is a deep ferruginous brown.

In young birds almost the whole upper plumage is black with rufous edges which soon wear off ; the nape is tinged with rufous and the tail marked with oval spots, as in the young of the last species. The chin and throat are pale and unspotted ; the breast and abdomen marked with long dark drops. In old birds these markings on the breast and abdomen almost entirely disappear.

Bill slate-blue, dark at the tip ; cere and orbital skin yellow ; iris deep brown ; legs yellow.

Females : length about 17·5 ; wing 12·75 ; tail 6·25 ; tarsus 2 ; mid-toe without claw 2 ; bill from gape 1·25.

Males : length about 15 ; wing 11·5. Ceylon birds are smaller than those from Northern India.

Distribution.—A resident species closely allied to the true Peregrine, which is migrant. Exceedingly rare in Ceylon, where it is found occasionally in the mountain zone, and round isolated hills or sea cliffs in the low-country. It occurs in rocky hills in or near forest throughout India and Burma, and perhaps in Afghanistan, but it is nowhere common.

Habits, &c.—A shy bird, which frequents inaccessible ledges of rocky cliffs. It hunts chiefly in the early morning and evening, and feeds exclusively on birds, chiefly pigeons, parroquets, swallows, and swifts. In its swoop it is as swift and bold as the larger Peregrine, and for this reason is a great favourite with Indian Falconers. It has been found breeding at Sigiriya in June. The nest is a mass of sticks placed on the ledge of a cliff. The three eggs are brownish-yellow, pinkish, or brick-red, speckled and blotched with reddish-brown. The ground colour may vary greatly in a single clutch. They are broad oval in shape, and measure about 2·05 by 1·65.

FALCO SEVERUS (Blanford Vol. III., p. 423 ;
Legge, p. 110).

The Indian Hobby.

Description.—Adult : Cheeks, sides of head, crown, and hind-neck black, shading into dark slate-gray with black shafts on the remainder of the upper parts ; wing quills and larger coverts black, the inner webs of the quills deep brown with some rufous bars or spots ; tail slate-gray with a darker bar near the tip. Chin, throat, and sides of neck white. washed with rufous ; rest of lower parts deep rusty red.

Young birds : Upper plumage brownish-black with light rufous edges to the feathers ; the inner webs of the tail feathers, except the central pair, banded with rufous ; breast, abdomen, wing lining, and tail coverts with long drop-shaped black markings.

Bill lead colour ; cere and orbital skin pale lemon-yellow ; iris deep brown ; legs yellow.

Females : length 11·5 ; wing 9·75 ; tail 4·5 ; tarsus 1·35 ; mid-toe without claw 1·35 ; bill from gape ·9.

Males : length 10·5 ; wing 8·5.

Distribution.—A very rare straggler, recorded from two or three up-country localities during the north-east monsoon. It occurs on the lower Himalayas eastwards of Kulu, in Assam, and Manipur, and occasionally during winter in the Indian Peninsula. It is also met with in the Malay Archipelago and New Guinea.

Habits, &c.—A mountain species frequenting wooded hills. It is crepuscular in its habits, and appears to feed on dragon flies, small birds, and lizards.

ERYTHROPUS AMURENSIS (Blanford, Vol. III., p. 424).

CERCHNEIS AMURENSIS (Legge, p. 119).

The Eastern Red-legged Falcon.

Description.—Adult male: Upper parts and tail dark slaty-gray; head, nape, back, and scapulars blackish; quills washed externally with silvery-gray; cheeks sooty-black; ear coverts paler. Lower surface ashy-gray; lower abdomen and under tail coverts deep ferruginous red; wing lining white.

Adult female: Upper parts slate-gray; head, neck, and upper back brownish; rump and tail paler; feathers of head and neck with dark shafts; rest of upper surface barred with black; the cheek-stripe, the feathers below the eye, and a band running back from the eye black; primaries blackish, the inner webs with many large oval white patches, except near the tips. Lower parts creamy-white or pale rufous, the breast with long black spots passing into arrowhead marks on the flanks and upper abdomen; lower abdomen and lower tail coverts unspotted; wing lining white with brown spots.

Young: Brownish, the feathers with indistinct pale tips; lower scapulars, inner secondaries, rump, and upper tail coverts grayish with pale tips and bars of dull black; tail gray with black bars; sides of face and throat white; nape mixed with white; lores and an indistinct moustache-stripe brown; under parts white; the breast with blackish central streaks to the feathers; thighs and under tail coverts buffy-white, the former tinged with rufous.

Bill fleshy red with a dusky tip; cere deep orange; iris hazel; legs orange-red.

Length 11.5; wing 9; tail 5; tarsus 1.1; mid-toe without claw 1; bill from gape .75. Females a little larger.

Distribution.—Immature stragglers have once or twice been procured in Ceylon. It is a migrant breeding in Northern China, and wintering chiefly in East Africa, but occasionally in India and Burma.

Habits, &c.—An insectivorous species, which hawks over grass lands mainly at dusk. A specimen shot by Legge at Trincomalee was busy feeding on grasshoppers. In its usual haunts it is rather gregarious.

ÆSALON CHICQUERA (Blanford, Vol. III., p. 427).

FALCO CHICQUERA (Legge, p. 110).

The Red-headed Merlin.

Description.—Crown, nape, sides of neck, ear coverts, and a narrow cheek-stripe chestnut; lores and a narrow forehead whitish; a few bristly feathers round the eye black; upper parts from the neck ash-gray; scapulars, secondaries, and wing coverts more or less barred with brown; primaries blackish-brown closely barred on the inner webs, except at the tip, with white; tail gray, with narrow black bars, a broad black band near the end, and a narrow white tip, lower parts white, with a few short blackish streaks on the breast, and black bars on the flanks and abdomen.

In old birds the dark bars on both the upper and lower plumage become narrow and tend to disappear. In young birds the gray feathers of the upper parts are barred with black, the crown and nape are dusky rufous with dark shaft-stripes, and the lower parts have a rusty tinge.

Bill bluish-black, greenish-yellow at the base; cere, eyelids, and legs yellow; iris lightish-brown.

Male: length 11·25; wing 8·25; tail 6; tarsus 1·5; mid-toe without claw 1·3; bill from gape ·80.

Females are rather larger: length 14; wing 9.

Distribution.—The inclusion of this bird in the Ceylon list tests on the authority of Layard, who watched a specimen at Point Pedro, but failed to secure it. It is found throughout India, being common in many parts.

Habits, &c.—Found chiefly in gardens, groves of trees in cultivated districts, or on the edges of isolated woods. It feeds mainly on small birds. A good lookout should be kept for it in the north of the Island, as it is quite possible that stray specimens occasionally wander across from India. It breeds in trees, making a neat nest of twigs lined with fibres. Four eggs are laid. They are brownish-red, mottled and blotched with darker red, and measure about 1·66 by 1·27.

TINNUNCULUS ALAUDARIUS (Blanford, Vol. III., p. 428).

CERCHNEIS TINNUNCULUS (Legge, p. 114).

The Kestrel.

Description.—Adult male : The head, the back and sides of the neck and a moustache-stripe bluish-ashy with dark shafts ; back, scapulars, and wing coverts brick-red, tinged with vinous, and scattered over with triangular black spots ; rump and upper tail coverts ashy-gray ; tail ashy-gray above, whitish beneath, with a broad black band near the end and a narrow white tip ; wing quills dark brown barred with whitish on the inner webs ; cheeks and ear coverts whitish with darker streaks ; lower parts pale or buff with brown streaks on the breast, which pass into spots on the lower breast and flanks ; lower abdomen and tail coverts unspotted ; wing lining white with some large black spots.

Female : Ground colour of upper plumage more brownish-rufous, with black streaks on the head and hind-neck, and with conspicuous black bands on the remainder of the upper parts and tail. The black band at the end of the tail is narrower than in the male. Wings and lower parts as in the male, but the latter are more heavily streaked and spotted. In old females the rump, upper tail coverts, and tail are more or less tinged with blue-gray.

Young males resemble females ; the tail turns blue-gray earlier than the head.

Bill bluish-black ; cere and eyelids yellow ; iris brown ; legs orange-yellow ; claws black.

Length about 14 ; wing 9·75 ; tail 6·75 ; tarsus 1·5 ; mid-toe without claw 1·10 ; bill from gape ·85. Females, as a rule, are slightly larger.

Distribution.—Found all over the Island during the north-east monsoon. Some birds appear to breed in the hills. The species occurs over the whole of Europe and Asia, breeding mainly in temperate climates and migrating southwards in winter, when it spreads over Northern Africa as well.

Habits, &c.—The Kestrel mainly frequents open plains, cultivated tracts, dry paddy fields, &c., flying over the ground with rapid beats of its wings. Every now and then it hovers

and then drops suddenly on its prey, which consists mainly of insects, lizards, frogs, and mice. A small dark resident form undoubtedly breeds in the Travancore hills, and may probably be found nesting up-country from April to June.

The nest is generally placed on ledges, or in the crevices of cliffs, occasionally in trees. The eggs usually number four or five. They are broad ovals, generally rather pointed at one end. The colour is brick- or blood-red, with deeper mottlings and blotches. Average size about 1·57 by 1·21.

Note.—It is possible that a Falconet—probably *Microhierax fringillarius* (The Black-legged Falconet)—may be found in Ceylon. These birds belong to a group which has a toothed bill like the Falcons. They are, however, extremely small, with a wing measurement of under 5 inches. They also differ from other birds of prey in their nidification, as they lay white eggs in a hole in the branch or trunk of a tree.

The species mentioned above has a total length of 6·5; wing 4; tail 2·25; tarsus ·75; bill from gape ·55.

In general appearance it is black, glossed with metallic-green on the upper parts; the flanks and thigh coverts are black; the lower parts white, more or less tinged with rusty-red; the forehead and a broad stripe from behind the eye down the sides of the neck are white.

This species is found in the Malay Peninsula, Southern Tenasserim, Sumatra, Java, and Borneo. Its presence in Ceylon was suspected by E. E. Green (*vide Spolia Zeylanica, Vol. VIII., p. 287*). He once saw a tiny Hawk pounce on a Bulbul and fly away with it. On another occasion a planter described to him how he had seen in Hewaheta two "black birds" fighting, and how one of them killed the other and flew away with it.



FIG. 1.



FIG. 2.



FIG. 3

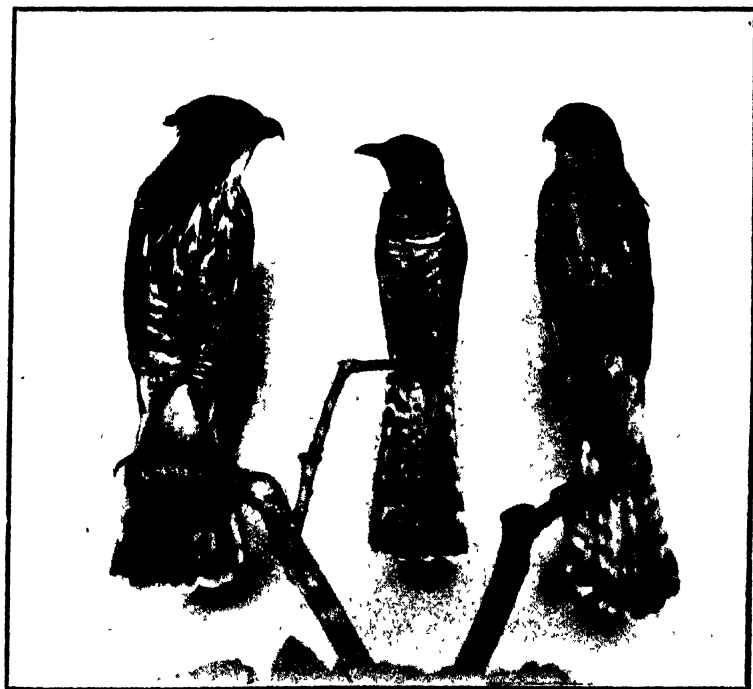


FIG. 4.

FIG. 5.

FIG. 1.—*Photodilus assimilis*.
FIG. 2.—*Haliastur indus*.

FIG. 3.—*Falco peregrinator*.
FIG. 4.—*Lophospizias trivirgatus*.

FIG. 5.—*Tinnunculus alaudarius*.

NEW CEYLON DIPTERA.

By R. A. SENIOR-WHITE, F.E.S.

(With two Plates.)

Mycetophilidæ.**PLATYURA TALAROCEROIDES** n. sp. (Pl. I., Fig. 4.)

Male.—Head : Vertex brownish, face and palpi yellowish. Antennæ yellow, apparently only fifteen-jointed, the two scapal joints somewhat broader than those of the flagellum, and very small. The first twelve flagellar joints each bear a finger-like pectination, nearly as long as the whole flagellum, the first nine joints closely sessile and very small, gradually lengthening from tenth to twelfth, the latter as long as the two preceding joints. The pectinations of the first five joints are decumbent, the rest gradually arise to nearly porrect in the last three, though the apices of these bend slightly downwards. Apical joint simple, as long as preceding three together. The pectinations closely set with fine hairs, and bearing a terminal black bristle.

Thorax.—Dorsum brown, unmarked, with minute black bristles, pleuræ concolorous, metapleuron with black bristles. Scutellum small, with marginal row of chætæ, longer than width of scutellum.

Abdomen.—Slender, eight-segmented, bristly, especially apically. Tergal plates of hypopygium twice the length of the sternal. First segment wholly yellow, second to sixth with basal half black and apical yellow, seventh and eighth and genitalia wholly black. Venter banded similarly.

Legs.—Yellow. Tibiæ and tarsi closely set with minute black setæ. Spines of mid-tibiæ much longer than those of front pair.

Wings.—A little longer than the abdomen, venation normal. Basal section of fourth vein about one-third length of fork, sixth vein not quite reaching wing margin. Colour

pale smoky-yellow, apex slightly darker, only markedly so from upper branch of third vein to upper branch of fourth. Halteres paler yellow than thorax.

Long : 3 mm.

Described from unique male in perfect condition, except for loss of both hind legs beyond trochanters, taken on window. Suduganga, Matale, Ceylon, August 30, 1918.

Type in my own collection.

The fifteen-jointed antenna is a doubtful point; it may possibly consist of sixteen joints, as in the remainder of the genus, the appearance of the first flagellar joint indicating that it possibly consists of a fused first simple with pectinate second joint. This is the second species of the genus to be described with an eight-segmented abdomen.

EXECHIA ARGENTEOFASCIATA n. sp.

Female.—Head wholly orange-yellow, frons and vertex with fine golden hairs, a few black bristles along upper interior orbit. Eyes minutely pale pubescent. Middle ocellus absent. Antennæ arising from lower margin of an elliptical depression, of which the upper margins extend to halfway between root of antennæ and the ocelli, yellow, the apical six or seven joints of the flagellum very slightly darker, the whole flagellum with minute whitish pubescence. Palpi brown, the apical joint slender.

Thorax.—Dorsum orange, minutely golden pubescent. Above the dorsopleural suture a broad silvery stripe (width about one-third of orange area), which appears black, with only a fine silvery lower margin viewed from front or side. Pleuræ yellow. A row of stiff dark bristles around dorsopleural suture, weaker on anterior margin. Humerus with three strong bristles, a strong one on each posterior corner of thorax, and a præscutellar pair. The dorsopleural fascia has some bristles along its upper margin, and a few on the silvery area, irregularly placed. Scutellum concolorous with dorsum, very small, with traces of silvery pubescence, in certain lights, along its apical margin, above which is a row of small bristles. Metanotum steep, carinate. Metapleuræ with a few dark bristly hairs.

Abdomen yellow, laterally strongly compressed, with short yellow hairs. Segments slightly darker at base, a black median line on basal half of third to sixth segments. Hind margin of first segment dark. Belly pale. Genitalia consist of a pair of small lamellæ, below which is a conical organ with darker ovipositor at tip.

Legs yellow, except tarsi, which are blackish.

Wings slightly shorter than abdomen, pale yellow. Halteres slightly darker.

Long : 3 mm.

Described from a single female, taken flying round *Lantana* scrub in shade. Suduganga, Matale, Ceylon, May 4, 1919.

Type in my own collection.

EXECHIA CRISTATA n. sp.

Female.—Head. Frons black, covered with somewhat widely separated silvery-yellow pubescence. A transverse row of short black bristles over root of antennæ. Eyes minutely black pubescent. Antennæ, scape yellow, flagellum black, with minute pale pubescence.

Thorax yellow, with pale pubescence. Posterior half of dorsum with a dark brown circular patch, reaching nearly to wing roots, into which extends from in front a V-shaped yellow patch, the apex of which is nearly in a line with the wing roots. At posterior corners of thorax are small yellow patches extending inwards for about one-third the dorsal breadth, medianly the brown colour reaches the root of the scutellum. Pleuræ yellow, except ptero- and meta-pleuræ, which are grayish-brown. A row of small black bristles on anterior margin, five long dorso-centrals from anterior margin to base of V-mark, each row erect, but inwardly inclined, forming a dorsal crest. The two rows are continued, inwardly converging, by smaller, posteriorly directed bristles, along the margins of the yellow V-mark. Many irregularly placed small black bristles on the remainder of the dorsal area. Humerus with four strong bristles, a strong one above root of wings and on posterior corners. Scutellum large, dark brown, with two long parallel apical dark bristles reaching to middle of second abdominal segment. Meta-pleuræ with two strong black bristles. Metanotum dark.

Abdomen laterally compressed, tergum black, sternum yellow, except the last two segments, which are all black, the whole with pale pubescence. First segment with apical yellow dorsal band, segments two to five with apical black bands extending somewhat indefinitely into yellow sternal area.

Legs, coxæ and femora pale yellow, tibiæ appear darker from more closely set setulæ. Tarsi black.

Wings pale gray. Halteres yellow.

Long: $2\frac{1}{2}$ mm.

Described from a single female, taken on window at dusk. Suduganga, Matale, Ceylon, January 19, 1920.

Type in my own collection.

EXECHIA AMPULLATA n. sp.

Female.—Head: Frons black, with thick silvery pubescence. Eyes very minutely pubescent. Antennæ and palpi pale yellowish, apical half of flagellum slightly darker.

Thorax white, the dorsal surface occupied by a black ovoid mark with a short anterior narrower extension (on extremity of which the colour fades to brown), the pattern resembling an earthenware vessel. Pro-, meso- and ptero-pleuræ dark brown, remainder of pleural area white. A small brown patch at costal root of wing. Some strong setæ on anterior and lateral margins and on propleuron. Scutellum black, barely separated by a paler area from the thoracic pattern, apically two long erect setæ, interior to which is a pair of smaller porrect setæ, apically crossed.

Abdomen yellow, dorsally the whole of the first and second and posterior half of third to sixth segments black. Venter yellowish.

Legs.—Coxa and femora whitish, extreme tips of posterior femora darkened. Tibiæ slightly darker, tarsi blackish.

Wings slightly yellowish. Fork of fifth vein, short, occurring slightly exterior to origin of third vein. Halteres pale.

Long: $3\frac{1}{2}$ mm.

Described from a female in good condition taken on a window. Suduganga, Matale, Ceylon, March 15, 1920.

Type in my own collection.

EXECHIA ZEYLANICA n. sp.

Male.—Head: Frons very dark brown, a paler yellowish margin to upper orbits. A transverse line of black bristles above antennæ. Antennæ with scape yellow, flagellum blackish. Eyes minutely pale pubescent.

Thorax yellowish-brown, with minute black dorsal pubescence. A row of stiff bristles along anterior margin, five on each humerus, the two lower declinate, the upper reclinate, the two uppermost smaller. A few bristles along dorso-pleural suture, a strong supra-alar and two postalar bristles, and some, irregularly placed, on dorsum. Scutellum darker brown, with a pair of small, erect, subapical bristles. Pleuræ pale yellow, meso- and meta-pleuræ darker, the latter with stiff hairs.

Abdomen strongly laterally compressed, yellow, with basal black bands, narrow ventrally, but broadening dorsally to reach anterior margins of the segments. Fifth and sixth segments wholly black. First segment with narrow apical pale band, conspicuous viewed against the otherwise wholly black dorsal surface. Genitalia swollen, conspicuous, consisting of a pair of large, at least two-jointed, claspers, the basal joint the larger, brown, the apical blackish. Beneath the claspers are a pair of blackish, horny processes, from the underside of which, near tip of each, arises a yellow, arcuate spine, black tipped. Abdomen and genitalia bristly.

Legs.—Coxæ and femora pale yellow, tibiæ pale blackish-yellow, tarsi blackish.

Wings extending to tip of abdomen, grayish. Fork of the fifth vein short, commencing somewhat distal of the origin of third vein. Halteres, scape pale, capitellum black.

Long: $2\frac{1}{2}$ mm.

Described from a unique male, in good condition, taken on window, at dusk. Suduganga, Matale, Ceylon, April 15, 1920.

Type in my own collection.

This species differs from *E. basilinea* (Brunetti) in the much shorter fork of the fifth vein.

Tipulidæ.**TEUCHOLABIS ANNULOABDOMINALIS n. sp.**

Male, Female.—Head: Frons very wide, shining black. Cheeks brownish to yellowish. Nasus and palpi dark brown, the latter with a few scattered hairs. Antennæ, first scapal joint cylindrical, second subglobular, both brownish-yellow, darker apically. First flagellar joint more robust than the remainder, which are elongate-oval, brownish, paler basally, each joint with a whorl of a few hairs about as long as the joint itself. Flagellum distinctly fourteen-jointed, apical joint very small.

Thorax.—Neck and anterior portion entirely pale yellowish. Mesonotum pale yellowish, a broad præsutural black band with a median broad extension forward to collare, along each side of which is a line of dark hairs, and a pair of black circular supra-alar patches. Scutellum pale yellow, metanotum black. Anterior pleuræ pale yellow, with large black mesopleural spot divided from mesonotal black band by a yellow line along dorsopleural suture. Metapleura black. Thorax shining, naked, except for the above-mentioned median præsutural rows of hairs and a few scattered hairs postsuturally and on scutellar margin.

Abdomen black, the segments with prominent yellow apical dorsal bands, venter yellowish, except sixth segment in male, which bears a tuft of black hairs arising from a dark patch. Male genitalia dark, female yellowish-brown.

Legs.—Coxæ to tibiæ pale yellowish, the tips of femora and tibiæ broadly black, tarsi black, the whole thickly dark pubescent.

Wings.—Membrane slightly smoky, costal cell more yellowish. An indefinite dark patch at origin of second vein. Stigma dark, from which an indefinite brownish suffusion extends over the cross veins to fifth vein. Venation as in normal *T. fenestrata*. Halteres, scapo black, capitellum elongate, very pale yellow.

Long: 5–6 mm.

Described from five males and one female, all from Suduganga, Matale, Ceylon.

Type male and female taken on December 19, 1918, resting on *Cajanus indicus* bush.

Types and other specimens in my own collection.

Tabanidæ.

HÆMATOPOTA RHIZOPHORÆ n. sp. (Pl. I., Fig. 1).

Female.—Face grayish, with white pubescence, a black band between the eyes below the antennæ. Palpi yellowish-gray, with basal pale hairs and black pubescence. Antennæ dark brown, the first joint very large, incrassate, shining, viewed laterally as broad as third joint at its widest, with black pubescence. Second joint very small, with thick black pubescence. Third joint broad and flattened on its basal annulation, the last three annulations forming a small apex. Apical annulation paler. Frons gray with sparse whitish decumbent pubescence, mixed with black erect pubescence, also sparse, but somewhat thicker posteriorly. Paired spots sub-triangular, touching eyes posteriorly, widely separated from frontal callus. Frontal callus dark brown, shining, almost straight on both borders, reaching eyes on lower border, slightly downward produced at angle between eyes and base of antennæ. Space between antennæ black, base of antennæ ringed yellowish above exteriorly.

Thorax brown with short pale whitish pubescence on dorsum, the three gray stripes distinct, narrow, the lateral ones ending in a gray spot at the suture. At base of thorax two slightly larger gray spots, above which the pale pubescence is thickened on each side of median stripe up to two-thirds of distance to suture. Pleuræ gray, darker below, with long whitish pubescence above sternopleural suture. Scutellum concolorous with mesonotum, with similar pale pubescence, except apically.

Abdomen brown, first three segments lighter reddish-brown, posterior margins of segments with pale pubescence, broader laterally. Underside dark brown.

Legs black. Femora slightly black pubescent. Fore tibiæ slightly incrassate, basally yellowish-white. Posterior tibiæ

with two yellow-white rings each, basal three-quarters of posterior meta-tarsi yellowish-white. Tibiæ without hair fringes.

Wings brownish-gray, veins brownish, paler anteriorly. Stigma very dark brown and prominent, as in *H. sinensis*. Apical band double, the outer row of four spots, of which the lowest is widely separated from the other three ; the inner line confluent with the outer at topmost spot just below second vein, continuous to lower branch of third vein, concave towards apex. The white spot exterior to stigma with dark centre. First rosette containing a white spot on each side of erect portion of anterior branch of third vein. Second rosette distinct, centered over the outer side of discal cell. Third rosette distinct, oval, centered over the cross-veins. Outer side of fourth rosette fairly distinct. A double marginal line of lunules in each posterior cell, and a double zig-zag line from base of third rosette to axillary angle.

Long (with antennæ) : 12 mm.

Described from a unique female in perfect condition captured on Beach road through mangroves, Trincomalee Harbour, on October 7, 1919.

Type in my own collection.

Very close to *H. litoralis* Ricardo, but differing in abdominal colour and pattern.

Drosophilidæ.

PHORTICA XYLEBORIPHAGA n. sp. (Pl. II.).

Male, Female.—Head : Back of head gray. Frons yellow, ocellar triangle dark. Parafrontalia narrow, silvery. Face silvery gray, epistome dark at sides, centre white, with more or less defined very narrow black median line. Proboscis dark brown, palpi yellow-brown. Antennæ yellow, third joint with fine pale pubescence. Arista with the small basal joint yellow, remainder black. In male the arista is bare, with only vestiges of rays, expanded apically into a leaf-like process. Female arista with weak short rays, no apical process. Cephalic bristles black ; verticals strong ; postverticals weak, parallel ; ocellar strong ; fronto-orbitals, superior two pairs,

inferior one pair, strong. Occipital row present. Central area of frons below ocellar triangle with many short bristles (generic character).

Thorax brownish-gray, thickly covered with short black bristles (generic character). A median and dorso-central dark bars, varying in intensity in various specimens, from anterior margin to level of wing roots. Scutellum concolorous bare. Pleuræ silvery. Dorso-central bristles, two pairs on hind margin, the anterior weak, posterior long and strong. Præscutellars shorter than the posterior dorso-centrals. Anterior to præscutellars a pair of the short thoracic bristles are almost sufficiently strong to be differentiated as macrochaetæ. Humeral and both notopleurals strong, supra-alar two, sternopleurals strong, two. Remaining bristles absent. Scutellum with four strong bristles, the apical pair crossed. All bristles black, and more strongly developed in the female.

Abdomen.—First two segments yellowish-white, the central and anterior marginal areas of the second more or less brown. Remaining segments very dark brown, the hind margin of the third (and in the female of fourth and fifth) narrowly edged pale. The whole with short dark bristles, more numerous posteriorly. Male genitalia concealed, in one specimen a pair of small black-tipped thorn-like processes are visible.

Legs.—Entirely yellow, with fine black setæ. Fore tarsi of male not dilated.

Wings.—Unmarked. veins yellow, venation normal. Halteres pale yellow.

Long : $1\frac{1}{2}$ –2 mm.

Described from four males and one female. One male (type) in fair condition from Narangalla estate, Badulla district, Ceylon, November 28, 1919 (F. P. Jepson); the others in poor condition from Hunasgiriya Group, Wategama district, Ceylon, March, 1920 (F. P. Jepson). The female (type), from Diyaluma estate, Koslanda district, Ceylon, June 10, 1915 (E. R. Speyer). The female in good condition, but gummed on card.

Type male in my own collection. Type female in collection. Department of Agriculture, Peradeniya, No. 5,091 B.

There is nothing in Schiner's generic description of *Phortica* to prevent this species being included therein. Williston's figs. ("North American Diptera," fig. 118, 1 and 2) show a much greater marginal convergence of veins 3 and 4 than in the species now described, but his note on page 301 of the same work shows that there are species included in the genus with the first posterior cell wide open. (Schiner says "thence parallel to each other to the wing margin.") As regards the dilated front tarsi of *Ph. scutellaris*, referred to by Williston (*id. loc. cit.*), this would appear to be contrary to a generic character, which states "legs simple." The genus will probably have to be divided up when overhauled by a specialist.

The species described above is almost certainly that referred to by Rutherford (Trop. Agric., XLII., p. 220), but his specimens are not to be found. When he wrote, the habits of the insect were in doubt, but recently Mr. F. P. Jepson (Entomologist in charge of Shot-hole Borer Investigations) informs me (*in litt.*) that he has seen the larva eat a pupa of the beetle, tunnelling completely inside, and sucking it dry in about 20 minutes. The specific name suggested is proposed, therefore, on account of this.

Trypetidæ.

RIOXA MAGNIFICA n. sp. (Pl. I., Fig. 2).

Female.—Head: Frons yellow, a brown median stripe, expanding indefinitely below lower superior orbital. Face yellow. Parafacialia with silvery pubescence, epistomal margin black. Antennæ yellow, arista plumose, but basal third of underside nearly bare. Palpi black, proboscis yellow. Cephalic bristles all black. Interior orbitals two, lower weak. Between superior and inferior orbitals on each side a pair of very small bristles. Ocellar nil, outer vertical wanting, genal strong, occipital row well-developed. Back of head yellow, bristly, a noticeable tuft of short bristles above junction of neck.

Thorax.—Yellow, scutellum concolorous. A black stripe dorso-centrally from anterior margin to root of scutellum, another along dorso-pleural suture to wing root, a third from

propleuron to slightly beyond mesopleural bristles, a fourth along sternopleural suture, broadening on to whole of meta-pleuron and metanotum, thus ringing lower and hind margins of thorax with black. All bristles black, præsutural wanting, pteropleural and sternopleural weak. Intermediate scutellar weak. Halteres pale yellow.

Abdomen.—Broadest at junction of second and third segments. Yellow, with slight concolorous pubescence dorsally. A black transverse band occupying basal half of second segment and a broad black longitudinal stripe along dorsal margins of third to sixth segments, leaving only the median area yellow. Venter yellowish throughout. Ovipositor as long as whole abdomen, yellow, darkening apically. Short black bristles along sides of segments two to six.

Legs yellow, posterior tibiæ black, except apices. Front femora with seven bristles beneath, basal three weak. Mid tibiæ without bristles.

Wings.—Ground colour yellow, stigma wholly black. Beyond stigma a marginal black band gradually broadening from end of first vein to middle of third posterior cell, where its width is nearly half that of the wing, extending into discal cell. Along third vein this band is broadly and rectangularly extended as far inwards as a point in line with extremity of first vein. A hyaline marginal lunule in second posterior cell. From stigma a broad black band extends basally to sixth vein beyond anal cell, apex of which alone is infuscated. There is an outward extension of this band over the anterior cross-vein almost to join the inner margin of apical band in discal cell, the area of separation being itself faintly infuscated. Axillary and second basal cells slightly infuscated.

First vein ending in the middle between the auxiliary and second veins. Anal cell prolonged to a point hardly in advance of second basal cell. No costal bristle.

Long (with ovipositor) : 9 mm.

Described from a unique female in good condition taken on window. Suduganga, Matale, Ceylon, March 4, 1920.

Type in my own collection.

This species apparently comes in *Rioxa*, though the absence of the præsutural bristle is contrary to a generic character.

STAURELLA ZEYLANICA n. sp. (Pl. I., Fig. 3).

Female.—Head yellow-gray. Occiput slightly raised, ocellar triangle brownish-orange, from whence a very indefinite darker band down centre of frons to frontal lunule, which is pale yellow, and prominent. All bristles black, lower orbitals three (there is also a smaller bristle between the two lower ones on right side); the superior orbital not inserted upon a prominent tubercle. Ocellar bristles present. Postverticals strong, *crossed*. Antennæ yellow, the third joint with pale pollination. Arista darker yellow, long, pectinate on both sides. Proboscis and palpi yellow.

Thorax yellow-brown, with short black pubescence. Humeral calli pale yellow. All bristles black, three mesopleural. Pleuræ concolorous with dorsum, but black pubescence somewhat sparce. Pteropleuræ very pale yellow between root of wings and pteropleural bristle. Metanotum concolorous, shining, with pale pollination. Scutellum pale yellow, triangular, with slight black pubescence, stronger towards outer margins, the four bristles strong and long, the median pair crossed at apex. Halteres slightly paler than pleuræ.

Abdomen narrow and elongated, broadening from base to junction of the fused first and second segments with the third segment, thence tapering uniformly. First and second segments, and median area of third, yellowish, fourth and fifth blackish. Third segment with median dark lunule, and a large brown oval mark at edge of dorsal margin. Bristles black, prominent at sides of first, second, fourth, and fifth segments. Venter yellowish. Ovipositor circular in section, longer than abdomen, narrow and truncate apically, shining black, covered with dense black pubescence, which appears gray against ovipositor in certain lights.

Legs.—Uniformly pale yellow.

Wings without costal bristle, veins brownish. Stigma brownish, the colour continued below to third vein. Apical half of wing very dark brown. There are three narrow hyaline areas along outer margin in submarginal and first and second posterior cells respectively. A very small lighter patch in

first posterior cell in angle made by junction of third vein with the anterior cross-vein, and another, somewhat larger, and sagittiform, in outer half of discal cell. The dark colouration is prolonged inwards in first basal and discal cells nearly to the anterior basal cross-vein. As in *S. nigripeda* the anterior cross-vein is slightly beyond the middle of the discal cell. There are two small bristles on third vein immediately beyond its separation from second vein.

Long : 7 mm.

Described from a unique female in good condition taken on *Lantana* scrub. Suduganga, Matale, Ceylon, March 30, 1919.

Type in my own collection.

The crossed postvertical bristles are contrary to a family character, whilst Bezzi, in his generic description (*Mem. Ind. Mus.*, III., p. 121), says nothing of their direction, from which it may be assumed that they are normal, *i.e.*, parallel or diverging. In the species here described they would appear to be stronger than the generic character lays down. The three mesopleural bristles are abnormal, but in all other respects the species agrees well with Bezzi's genus, wherein I leave it for the present.

Sciomyzidae.

TRIGONOMETOPUS ZEYLANICUS n. sp.

Male.—Head frons flattened, horizontal (generic character), at its narrowest (opposite fronto-orbital bristles) about one-third width of head; widened at vertex, brownish-yellow, paler along eye margins. Ocellar triangle well below vertex, situated in the anterior half of an ovoid slightly darker area extending to behind vertex, the area between the actual ocelli very dark brown. Verticals two, interior converging, exterior diverging. Postverticals crossed. Ocellar small. Fronto-orbitals two pairs, occipital row strong. The central area of frons, below ocelli, with a double row of small bristles, and on anterior border, between lower fronto-orbitals and antennæ, the whole area bristly. All cephalic bristles black. Face very retreating (generic character), carinate below antennæ, wholly yellow. A small cuneiform dark brown spot extends from anterior eye margin to root of antennæ. A row of black

bristles from lower edge of facial carina to back of head. Postocular area laterally blue dusted, sharply defined from yellow genal area below. Proboscis yellow, geniculate. Antennæ brownish-yellow, second joint spinulose at tip, with an upper and two lower erect bristles apically. Third joint twice as long as first and second together, microscopically pale pubescent. Arista long, minutely pubescent, black except for extreme base, yellowish.

Thorax dark brown-yellow, violet-gray dusted. A median and two dorso-central somewhat ill-defined narrow yellow stripes, the median continued to tip of concolorous scutellum. Pleuræ concolorous, a yellow line along dorso- and sterno-pleural sutures, widened posteriorly over most of ptero- and hypo-pleuræ. Präscutellar present, dorso-centrals three, the anterior at about one-third from front margin of thorax, humeral and posthumeral (2) strong, præsutural weak. Meso-pleural and sterno-pleural strong, ptero-pleural wanting. Anterior supra-alar strong. Scutellum with four strong bristles, apicals parallel. All thoracic bristles black.

Abdomen.—Dark or pale brown, paler ventrally, black pubescent. Genitalia consist of a broad brown-yellow plate bearing apically a pair of prominent bristly black lamellæ.

Legs.—Pale yellowish, except apical four joints of fore tarsi, which are dark. Fore femora with a number of stiff hairs above and below, posterior femora nearly bare, and with a small bristle before tip. Fore and hind tibiæ with pre-apical bristle, mid tibiæ with extensor surface bristle much nearer tip and thicker.

Wings.—Pale gray, a dark suffusion above second vein, behind which it gradually merges into ground colour of wing. Cross-veins, especially posterior, somewhat suffused. Auxiliary vein distinct throughout from first vein, which ends a little beyond it at about one-third of wing. Second, third, and fourth veins approximately parallel, third ending at wing tip. Anterior cross-vein at middle of discal cell, posterior cross-vein at less than its own length from tip of fifth vein. Anal cell as long as second posterior.

Long : $3\frac{1}{2}$ mm.

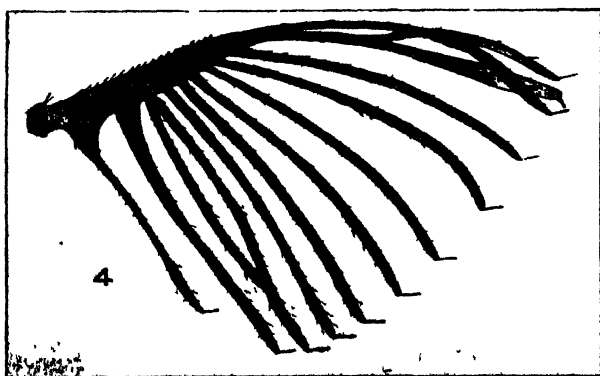
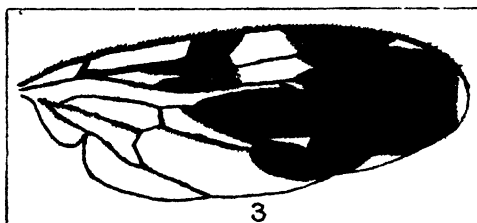
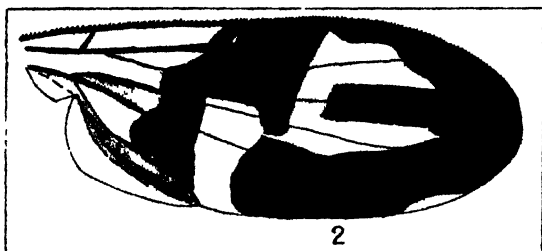


FIG. 1. *Hematopota rhizophoræ*, wing.
 FIG. 2.—*Rioxa magnifica*, wing.
 FIG. 3.—*Staurella zeylanica*, wing.
 FIG. 4.—*Platyura talaroceroides*, ♂ antenna.

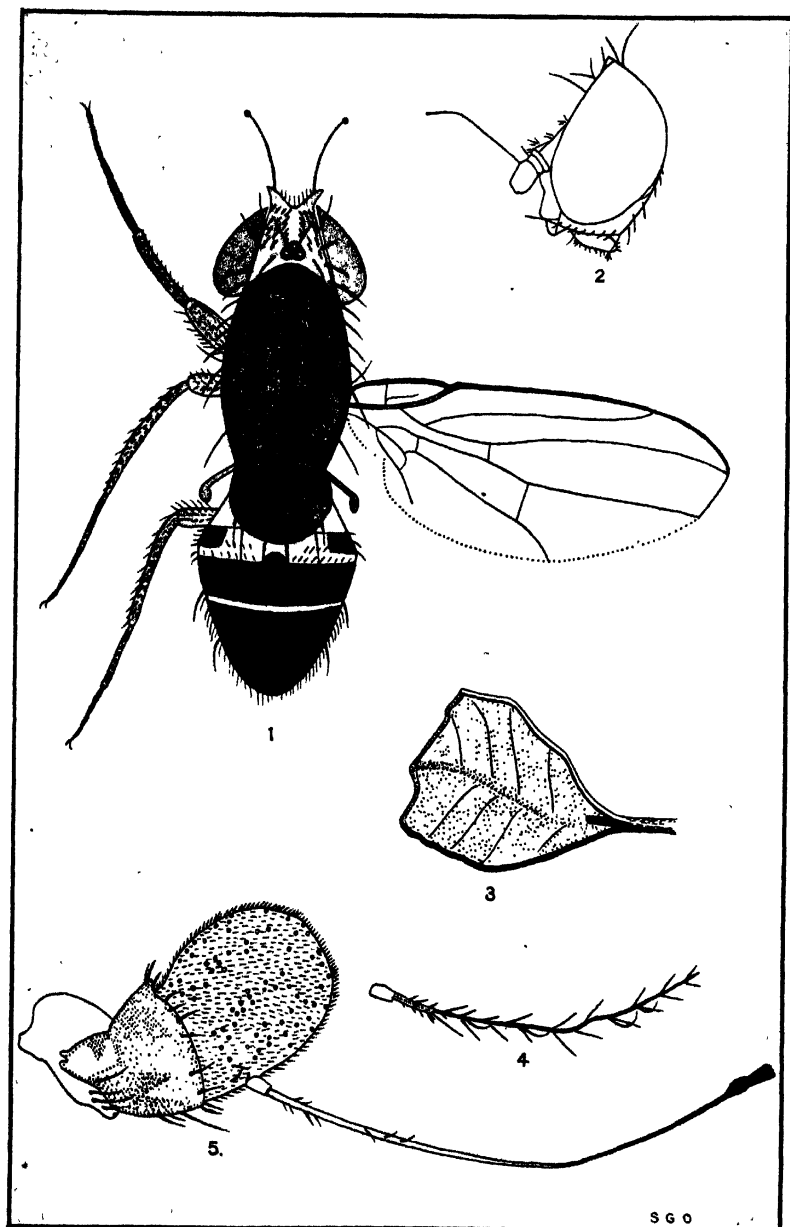


FIG. 1.—*Phortica xyleboriphaga*, ♂.
 FIG. 2. Do. ♂ head from the side.
 FIG. 3. Do. terminal process of ♂ arista ($\times 1000$).
 FIG. 4. Do. ♀ arista.
 FIG. 5. Do. ♂ antenna.

Described from three males, all in perfect condition, taken on *Hibiscus rosa-sinensis* hedge on January 16 and 18 (type) and on *Lantana* scrub, February 6, 1920. Suduganga, Matale, Ceylon.

Type and other specimens in my own collection.

Mimics a Jassid in appearance and movements very closely.

This is the first species of the genus to be described from India south of the Himalaya.

NOTES ON SOME CEYLON SNAKES.

By Lieut.-Colonel F. WALL, C.M.G., C.M.Z.S., F.L.S., I.M.S.

DR. PEARSON has submitted me for examination two collections of snakes, one from Anasigalla Estate, Matugama, Kalutara District, at about 50 feet elevation above sea level, made by Mr. W. W. H. Phillips, and the other from Vavuniya, in the Northern Province, made by the District Mudaliyar.

Both collections are of unusual interest, as they were made during the months July to September, during a period when many snakes are breeding, and the fact that the collectors affixed dates to their captures makes both collections exceptionally valuable. If others would collect with similar care, a very great deal of information would soon be available regarding the diet, breeding, distribution, &c., of Ceylon snakes, about which we now know very little or nothing:

Family **TYPHLOPIDÆ.****TYPHLOPS BRAMINUS** (Daudin).

A specimen 140 mm. ($5\frac{1}{2}$ inches) long was extracted from the stomach of an *Ancistrodon hypnale* from Anasigalla. The head is semi-digested, but the scale rows 20, a tail ending in a caudal spine, and the colour all agree with *braminus*.

Family **ILYSIIDÆ.****CYLINDROPHIS MACULATUS** (Linné).

Five Specimens. All from Anasigalla.

Date	Lengths in mm	Costals.				Subcaudals.	Remarks
		Two Heads-lengths behind Head.	Midbody.	Two Heads-lengths before Vent.	Ventrals		
1920.							
July 19	311	19	21	19	200	4	Last ventral 3 fid.
Aug. 4	343	19	19	19	197	4	Last ventral 3 fid.
Aug. 6	330	19	21	19	196	5	Last 2 ventrals 3 fid.
Aug. 11	305	19	21	19	201	4	Last ventral 3 fid.
Aug. 11	202	19	21	19	191	5	Last ventral 3-fid.

Family **UROPELTIDÆ.****RHINOPHIS OXYRHYNCHUS** (Schneider).

A very fine specimen 520 mm. (1 foot $8\frac{1}{2}$ inches) long was killed at Vavuniya on August 10. The costals two heads-lengths behind the head are 19, at midbody 17, and two heads-lengths before the vent 17. Ventrals 211. Subcaudals 5 (the last 4 entire). This proved to be gravid, and contained ten eggs about 16 by 9 mm. No trace of embryos could be discovered.

Family **COLUBRIDÆ.****POLYODONTOPHIS SUBPUNCTATUS** (Dumeril & Bibron).

Two specimens from Anasigalla.

A ♀ 324 mm. ($12\frac{3}{4}$ inches) long killed on July 14 has 170 ventrals and 50 subcaudals. A ♀ ? 317 mm. ($12\frac{1}{2}$ inches) long, date uncertain, has 171 ventrals and 56 subcaudals. In both the supralabials are 10, the 8th cuneate and not reaching the margin of the lip, the 4th, 5th, and 6th touching the eye.

NERODIA PISCATOR (Schneider).

One variety *asperrimus* from Anasigalla.

One variety *typica* from Vavuniya is uniform brown dorsally in the posterior two-thirds of the body. Anteriorly there are four series of smallish, black, rather indistinct, quincunciate spots, the outer row almost obsolescent. In both these specimens the keels are exactly alike, being absent in the last row only in the anterior part of the body, but present and rather feeble before the vent.

AMPHIESMA STOLATUS (Linné).

Two specimens from Anasigalla and one from Vavuniya. A ♀ 628 mm. (2 feet $\frac{3}{4}$ inch) long, killed at Anasigalla on August 17, is gravid and contains five eggs. Both the Anasigalla specimens have unusually large, black, well-defined, lateral, ventral spots, especially anteriorly.

ASPIDURA GUENTHERI Ferguson.

Nine specimens were collected from Anasigalla, details of which are shown below :—

Date.	Sex.	Lengths in mm.	Costals.				Ventrals.	Subcaudals.	Remarks.
			Two Heads-lengths behind Head.	Midbody.	Two Heads-lengths before Vent.				
1920.									
Sept. 18	♂	140	17	17	17	105	28	Gravid. Two small eggs in abdomen	
?	♀	127	17	17	17	108	21	—	
Sept. 18	♀	145	17	17	17	115	21	An earthworm in stomach. Second subcaudal divided	
Sept. 21	♀	152	17	17	17	114	21	—	
Do.	♀	66	17	17	17	115	20	—	
Do	♀	69	17	17	17	114	22	—	
Do.	♂	63	17	17	17	108	29	—	
Do.	♂	69	17	17	17	106	25	—	
Do.	♂	63	17	17	17	104	26	—	

The gravid ♀ may have been killed between July and September, but the label was unfortunately detached. The last five specimens were all found together, and evidently constitute a brood just hatched or born. This is the most diminutive of all the Colubrine species known to me, being mature as shown by the gravid ♀, when only 127 mm. (5 inches) long. All the other four species of the genus are up-country snakes.

CERCASPIS CARINATUS (Kuhl).

Three specimens of this little-known snake were collected at Anasigalla, the details of which are below :—

Date	Sex.	Costals.				Ventrals.	Subcaudals	Remarks.
		Length in mm.	Two Heads-lengths behind Head.	Midbody.	Two Heads-lengths before Vent.			
19 ²⁰ .								
July 15	♂	635	17	21	49	192	58	15 white indistinct bands on body.
Aug. 11	♂	349	17	19	17	193	57	17 + 6 white more or less distinct bands. A skink (<i>Acontias burtoni</i>) in stomach.
Aug. 15	♀	628	17	19	17	189	52	17 + 3 more or less distinct white bars. Gravid. Contained seven eggs about 9 by 12 mm.

DRYOCALAMUS NYMPHA (Daudin).

One very nice little specimen was obtained at Vavuniya 298 mm. (11 $\frac{3}{4}$ inches) long on August 10. The ventrals are 210, subcaudals 78, and the costals 13 in the whole body length. There are 22 whitish bands on the body, and 18 on the tail. The anterior bands have brown spots arranged transversely, and the posterior are divided into pairs by irregular, transverse, brown cross bands.

ZAOOYS MUCOSUS (Linné).

A juvenile specimen from Anasigalla.

COLUBER HELENA Daudin.

One small specimen from Anasigalla 355 mm. (14 inches) long killed on October 17.

DENDROPHIS BIFRENALIS Boulenger.

A fine ♀ 920 mm. (3 feet and $\frac{1}{4}$ inch) long was killed at Vavuniya on August 10. The ventrals are 162, and

subcaudals 146. The stomach contained a much-digested, large, tree frog with dilated toes (*Rhacophorus* spec ?).

DENDRELAPHIS TRISTIS (Daudin).

A single ♂ specimen from Anasigalla 983 mm. (3 feet 2½ inches) long was killed on September 18. Ventrals 165. Subcaudals 120. It contained a much-digested skink (? *Acontias*) in the stomach. As in all the other Ceylon specimens I have seen, there is a conspicuous yellow vertebral stripe for a limited extent anteriorly.

OLIGODON ARNENSIS (Shaw).

A juvenile specimen 209 mm. (8¼ inches) long is from Anasigalla, killed on July 13. The ventrals are 164, and subcaudals 50. It has 13 blackish bars on the body, and 6 on the tail.

OLIGODON TEMPLETONI Günther.

A good ♂ specimen of this uncommon snake is from Anasigalla. It was killed on September 16, and measures 209 mm. (8¼ inches). The ventrals are 128, and the subcaudals 33.

OLIGODON SUBLINEATUS Dumeril & Bibron.

The first four referred to below were obtained at Anasigalla, and the two last from Vavuniya :—

Date	Sex.	Length in mm.	Costals			Ventrals.	Subcaudals.	Remarks.
			Two Heads-lengths behind Head.	Midbody.	Two Heads-lengths before Vent.			
1920.								
Aug. 15	♂	241	15	15	15	136	34	—
Aug. 23	♂	234	15	15	15	149	30	—
Aug. 23	♀	266	15	15	15	148	32	Contained two soft-shelled eggs in the stomach (anguine or lacertine) 17 mm. long.
Sept. 21	♂	228	15	15	15-13	136	37	—
Aug. 10	♂	238	15	15	15	137	35	—
?	♀	241	17	15	15	144	26	—

DRYOPHIS MYCTERIZANS (Linné).

Two from Anasigalla :—

Date.	Sex.	Costals.						Remarks.
		Length in mm.	Two Heads-length behind Head.	Midbody	Two Heads-lengths before Vent.	Ventrals.	Subcaudals.	
1920.								
July 18	♂	857	15	15	13	179	165	
July 13	♀	1054	15	15	13	178	125	Tail deficient. Gravid. Contained two sacs 35 mm. long.
Do.	♀	298	15	15	13	184	151	Fœtus of above folded nine times.
Do.	♂	324	15	15	11	179	171	Fœtus of above folded ten times. Genitalia not exerted.

DRYOPHIS PULVERULENTUS (Dumeril & Bibron).

One ♂ specimen from Anasigalla killed on September 23 is 1.007 mm. (3 feet 11½ inches) long. Ventrals 187. Subcaudals 182. A lizard (*Calotes* spec ?) in stomach.

CHRYSOPELEA ORNATA (Shaw).

A ♂ specimen from Vavuniya killed on August 10 measures (tail slightly deficient) 755 mm. (2 feet 5½ inches). Ventrals 206. Subcaudals 113 ? Unlike every other specimen of this species I have seen the last ventral is not bifid.

This constitutes a colour variety quite new to me. The ground colour dorsally is olive-brown. The body is crossed by black zig-zag bars narrowing in the flanks, and most conspicuous in the anterior part of the body. Ventrally yellowish-gray, most ventrals with a black spot in the suture just outside the keel. Head with the usual double crossbars.

BUNGARUS CEYLONICUS Günther.

Seven specimens, all from Anasigalla :—

Date.	Sex.	Length in mm	Costals.			Ventrals	Subcaudals	Remarks
			Two Heads-lengths behind Head.	Midbody.	Two Heads-lengths before Vent			
1920.								
Aug. 2	♂	189	15	15	15	222	39	19 + 5 white bands.
Aug. 3	♂	666	15	15	15	222	36	20 + 4 white bands.
Aug. 3	♂?	432	15	15	15	224	34	16 + 4 white bands. A snake (<i>Aspidura guentheri</i>) in stomach.
Aug. 6	♂?	482	15	15	15	224	34	17 + 3 white bands. A snake (<i>Aspidura guentheri</i>) in stomach.
Aug. 6	♂	495	15	15	15	226	35	18 + 3 white bands.
Aug. 9	♀?	425	15	15	15	230	36	18 + 4 white bands. A skink (<i>Acontias burtoni</i>) in stomach.
Sept. 16	♂	445	15	15	15	227	36	18 + 3 white bands. A snake (<i>Aspidura guentheri</i>) in stomach.

NAIA TRIPUDIANS Morrem.

A single specimen from Anasigalla killed on September 22 measures 523 mm. (1 foot 8½ inches). This is a very distinct variety new to me. Dorsally it is brown, finely but distinctly mottled with darker tones, with a tendency to form transverse barring. Ventrally pale brown with 19 well-defined black bars before the vent, the most anterior beneath the hood involving 5 ventrals, the succeeding bars involving fewer ventrals till only one is involved posteriorly. A binocellus on the hood. Head sutures blackish.

Family VIPERIDÆ.

ANCISTRODON HYPNALE (Merrem).

Eight specimens, the first six detailed below from Anasigalla, the last two from Vavuniya :—

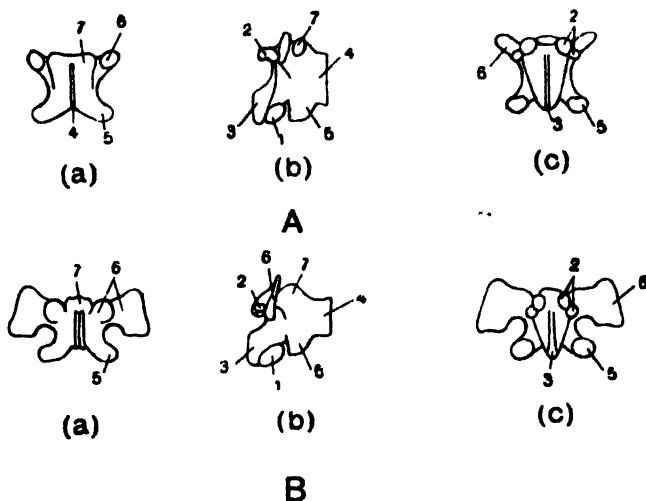
Date.	Sex.	Length in mm.	Costals.			Ventral.	Subcaudals.	Remarks
			Two Heads-lengths behind Head.	Midbody.	Two Heads-lengths before Vent.			
1920.								
July 13	?	292	17	17	17	146	?	A snake (<i>Typhlops braminus</i>) in a convoluted mass in stomach.
July 19	♂	356	17	17	17	151	45	—
July 20	♂	311	17	17	17	145	36	—
Aug. 3	♂	305	17	17	17	153	41	—
Aug. 7	♂	400	17	17	17	149	37	—
Aug. 9	♂	361	17	17	17	151	47	—
Aug. 10	?	?	17	17	17	147	41	—
Aug. 10	♂	345	17	17	17	152	40	—

The lepidosis in all these agrees in the following respects. There is a small boss on the snout involving from 3 to 5 scales. The supracoculars are as long as the parietals, and distinctly broader than the frontal. The second supralabial does not enter the loreal pit.

In addition to the above snakes, two specimens of the anguine, tridactyle lizard *Acontias burtoni*, were included in the collection from Anasigalla.

NOTES.

Notes on the vertebræ of Cercaspis carinatus vel Lycodon carinatus (Kuhl).—For many years I have had a firm conviction that the snake now known as *Lycodon carinatus* should not be placed in that genus. My view was based, however, on lepidosis alone, and until quite recently I have not been able to acquire a specimen that I could study osteologically. Thanks to Mr. Drummond-Hay, who gave me a very large example recently, I have been able to add cranial and vertebral specimens to my cabinet collection. The skull, including dentition, is so extremely like that of *Lycodon aulicus*, that one readily grasps the justification for its inclusion in the genus *Lycodon*, but the vertebræ of the two species are so remarkably different that I have no hesitation in placing *carinatus* in a genus of its own, thus supporting the views of Kuhl, Dumeril and Bibron, Gunther, and Jan. Dumeril and Bibron's name is retained to denote the genus.



A. *Lycodon aulicus*. B. *Cercaspis carinatus*.

(a) Dorsal aspect; (b) lateral aspect; (c) ventral aspect.

(1) Condyle for articulation with vertebra behind; (2) condyles for articulation with rib; (3) hypapophysis; (4) neural spine; (5) postzygapophysis; (6) prozygapophysis; (7) zygosphenæ articulating with the zygantrum of the vertebra in front.

It will be seen from the attached figures that the prozygophyses are very remarkably developed, expanding terminally into large laminae, a condition I have only seen in one other genus of the Family Colubridæ, viz., *Bungarus*. These laminae are oblique, so that the anterior edge overlaps the posterior edge of the lamina of the preceding vertebra. The neural spine is slightly bifid, each lateral plate being overted so as to leave a shallow groove between.

Bangalore, July 20, 1920.

F. WALL.

Notes on some Ceylon Snakes recently acquired by the Colombo Museum.—Among a collection of Ceylon snakes recently submitted to me for identification by Dr. Pearson, I find the following that are worthy of note :—

Rhinophis trevelyanus ? (*Kelaart*).—A specimen of this genus that I feel much tempted to pronounce a new species was obtained at Mullaittivu in the low-country of the Northern Province in April this year. It does not accord with any species in Mr. Boulenger's Catalogue (Vol. I., 1890), and it is noteworthy that all the Ceylon representatives cited in the work referred to are up-country snakes known from the Central Province. The fact that there is only a single specimen upon which to base an opinion deters me from describing this as new, and I therefore refer it provisionally to *trevelyanus*, to which it appears to me most closely related. It is a male specimen 248 mm. in length. The costals are in 19 rows anteriorly and 17 in midbody and posteriorly. The ventrals number 205, and the subcaudals 8 (paired). The rostral is acutely-pointed, obtusely-keeled above, and measures just half the shielded part of the head. The frontal is as long as broad, and its length equals that of the parietals. The eye is less than half, but more than one-third the horizontal diameter of the ocular. The supralabials number four. The caudal shield is about three-fourths the length of the shielded part of the head. In colour it is blackish, with the margins of the scales whitish, those on the ventral aspect being more

broadly margined than those on the dorsal aspect. There is an irregular white patch before the anal shield. The rostral is reddish.

Polyodontophis subpunctatus (D. & B.).—One female specimen 413 mm. in length from Niroodamunai (Eastern Province) killed in January, 1920, proved to be gravid, and contained six eggs measuring 18 by 9 mm. with no trace of embryo. The loreal is confluent with the præfrontal on both sides. The ventrals number 178 and the subcaudals 58.

Dendrophis bifrenalis Boulenger.—One adult from Mullaittivu (Northern Province). The anterior loreal is confluent with the posterior nasal on the left side, but normal on the right. Ventrals 166, and subcaudals 153.

Oligodon subgriseus D. & B.—One from Mullaittivu variety *typica*. The ventrals are 175, and subcaudals 44.

Dipsadomorphus forsteni (D. & B.).—One juvenile specimen measuring 502 mm. was killed at Mullaittivu in April this year. Ventrals 261. Subcaudals 113. Costals in 27 rows in midbody.

Dipsadomorphus beddomi Wall.—A juvenile specimen from Mullaittivu. The costals are in 19 rows in midbody. Ventrals 258 (?). Subcaudals 92 (?). Tail slightly deficient.

Hydrus platurus (Linné).—An adult from the pearl banks. It is peculiar in that it is pale yellow ventrally, and has a series of grayish rhombs dorsally. The anterior rhombs are confluent, and the posterior discrete.

Enhydris curtus (Shaw).—Two adult specimens from the pearl banks. The female measuring 635 mm. was killed in February this year, and proves to be gravid. It contained four eggs 32 by 13 mm., with no trace of embryo.

Ancistrodon hypnale (Merrem).—Two from Mullaittivu (Northern Province). Ventrals 152 and 142 (?). Subcaudals 40 and 42.

Bangalore, June 22, 1920.

F. WALL.

Occurrence of Hypolaïs caligata (The Booted Tree Warbler in Ceylon).—A few months ago, while examining the duplicate skins of the Warblers in the Colombo Museum collection, I came across two birds labelled *Phylloscopus nitidus*, which had

evidently been wrongly classified. They appeared to be some species of *Hypolais*. I sent them home to Mr. E. C. Stuart Baker, who has kindly authenticated them as *Hypolais caligata*. This species breeds in Turkestan and Southern Siberia, wintering in Northern and Central India, and seldom penetrating to the very south of the peninsula. No member of the genus has hitherto been recorded from Ceylon. Both specimens were, I believe, obtained by the Museum collector in the Mannar District on the same day: February 15, 1905. one near Mannar and one at Murungan, 14 miles south-east of that town. From the distance apart of the two localities it would seem as if there had been a small invasion of this species at that time.

August 23, 1920.

W. E. WAIT.

Preliminary Note on some Fossiliferous Beds in Ceylon.—It has long been known that fossil shells occur in the Jaffna peninsula and neighbouring parts of Ceylon; but, until quite recently, no serious attempt was made to determine the age of the beds and to correlate them with any similar beds which may occur in India and elsewhere.

On various occasions during the last two years of research in the Island (1914–1916), as Assistant Mineral Surveyor, the writer had occasion to study these, and other sedimentary beds, discovered during that time, and to make a collection of fossils, which Dr. Arthur Morley Davies, Palæontologist at the Imperial College of Science and Technology, has kindly undertaken to describe. Dr. Davies' army work arising out of the great war has prevented him, until quite recently, from paying as much attention to his palæontological labours as he could have wished; thus, the description of the Ceylon fossils is of necessity belated. Enough has been done, however, to justify certain general conclusions. These will be set down below.

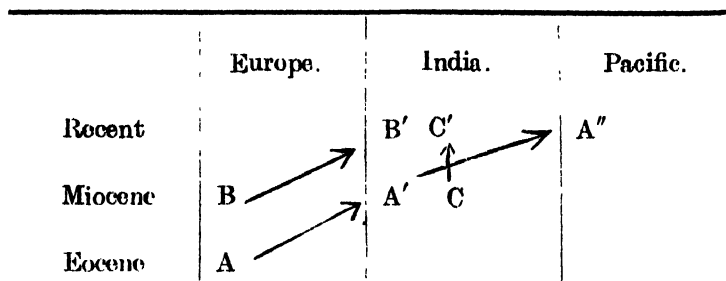
Apart from the generally known occurrences of fossiliferous beds in Jaffna and Kalpenty, others of similar age were discovered in the interior of the Puttalam District and along

the south-eastern shore of the Southern Province at Miniha-galkanda ; while another totally distinct and older set of sedimentary rocks was investigated in the neighbourhood of Tabbowa (North-Western Province). The rocks of the first group form a series of little disturbed lime stones and sandy beds of marine origin containing molluscan shells, echinoderm tests, corals and foraminifera, &c., while those of the latter are fresh-water sandstones, grits, and pipe clays containing fossil plants. These beds have been much affected by earth movements.

The general resemblance of some of the molluscan types to those of the Paris basin suggested a possible Eocene age for the Ceylon beds, while the entire absence of typical mesozoic forms, the general assemblage of genera present, and the main lines of the geology in general, pointed unmistakably to the conclusion that the limestones and associated sediments were not older than Eocene. In the absence of palæontological literature of value for comparative purposes, it was impossible to determine anything more than some of the genera present ; thus, while it was apparent that the beds were to be placed somewhere in the Kainozoic (Tertiary) group, nothing could be said with confidence of their exact position within it : but the writer was inclined to regard them as Eocene. Dr. Davies' researches have shown this assumption to be incorrect ; for he says in a letter to the writer : " I have been able to make more exact determinations of some of the species. The similar fossils described by Sowerby over eighty years ago, and by Archiac and Haime over sixty, are in the Natural History Museum, and I have been able to compare yours with them. Altogether a great many interesting points will be raised. There can be no question about the Miocene age."

It is interesting to note in this connection that while the fossil faunas of the three districts represented (Jaffna, Puttalam, and Minihagalkanda) are practically contemporaneous, only one species in the collections is common to all, and only two well-defined species are common to any pair. It is further to be remarked, as Dr. Davies points out, that inasmuch as some of the Ceylon fossils are related to Paris Eocene forms, the general assemblage seems to bear out Dr. Noethling's

conclusion (drawn from a study of the Burma Miocene), that there has been an easterly migration of molluscan forms in tertiary times. He puts it diagrammatically thus :—



With regard to the fossil plants of the Tabbowa beds, we may count ourselves very fortunate, in that Professor Seward, of Cambridge, has kindly consented to deal with them. His pronouncements will be awaited with interest. The writer's tentative opinion was that the Tabbowa plants belonged to the *Glossopteris* or some other closely related flora. If this view proves correct, it must follow that the beds containing them owe their origin to the destruction of part of the lost continent (Gondwanaland), which, according to Süess and his followers, extended from Brazil on the west to Australia on the east, and included parts of Africa and India.

May 26. 1920.

E. J. WAYLAND.

Notes on the Natural History of the Tic-Polonga.—While occupying the post of Superintendent of an estate at Ambalangoda, a cooly brought me a tic-polonga whose head had been crushed by blows from a stick.

The snake, its mouth full of blood and eyes protruding from their sockets, showed no signs of life. It was a fine specimen, 3 feet long. Knowing the vitality of these reptiles, I placed it in a cage to see if the snake would survive its injuries.

For some days the tic-polonga showed no signs of life, though there was no smell of putrefaction, a sure sign that death had not occurred. Notwithstanding this, I had to wait three or four weeks before I could detect definite signs

of life in my prisoner. After this the moribund snake quickly recovered and very soon resumed its old habits, devouring with pleasure rats and squirrels, its two favourite dishes.

In January, 1912, anticipating a move, I sent my wonderful friend to the Colombo Museum, asking the Director to look after it. He consented, and the tic-polonga became a pensioner of the State, and was exhibited to the public in the Museum Gardens.

In December of that year the Director, Dr. Pearson, sent the snake to a Russian lady naturalist (a friend of mine), who had expressed a desire to study reptiles. The box bearing the marks "Caution, poisonous snake" arrived while this lady was away on a visit up-country. It was, therefore, decided not to open the box until her return, and in consequence the unfortunate prisoner spent a miserable two months without food or drink. In the end my friend gave up the idea of reptile study, and the box containing the tic-polonga was returned unopened to my residence at Talgaswella.

Having had a cage made, I proceeded with all necessary caution to take off the lid of the box in which the snake was sent to me and to empty the contents into the cage. Imagine my astonishment on seeing, instead of a half dead snake, one full of life disporting itself in its prison.

I immediately decided to feed it. A squirrel which I had just shot was swallowed in a flash. I saw the jaws of the snake open, and the squirrel, seized by the head, disappeared bit by bit. Afterwards the snake had a drink of water. This happened on February 23, and on the 24th a second squirrel was given and consumed in the same way, a third on the 25th, a fourth on the 26th, and a fifth on the 27th. It was only when the sixth one was given to the reptile on the 28th that its appetite seemed to be satisfied, and it then appeared to be filled to repletion.

These observations, it will be seen, are of more than ordinary interest. First, in recording the unexpected revival and recovery of the snake after having sustained such serious injuries to its head that the reptile showed no signs of life for several days; and further, in proving that the tic-polonga is

able to maintain its health after a fast of two months. Finally, it is worthy of note that the snake has such an extraordinary capacity for food after a long fast.

The snake lived for several years after the above incidents, but it has now been killed.

Talgaswella, June 30, 1920.

E. NICOLLIER.

Disappearance of Butterflies from certain Localities.—The disappearance is mainly due to three causes: (1) Disease; (2) parasites; and (3) extinction of the food plant. Of these, the first two are usually only temporary in their effect, while the third is generally permanent.

In my notes on butterflies published in the last issue of the "Spolia," Mr. Mackwood writes that *Callosune limbata* was "particularly abundant in Fort Frederick, Trincomalee." Colonel Manders also gave this locality in his notes. I have only visited Fort Frederick in October, November, and December (1917 and 1918), so may have missed the best season, but I have never seen a single specimen of this insect there. A few years ago a few spotted deer were loosed in the Fort, and there is now a big herd there. Can the disappearance of *C. limbata* be due to the destruction of the food plants by the deer?

In my notes I mention that the activities of the Forest Department have caused the disappearance of *R. benjamini* from the jungle above Haputale. *Lethe daretis* has also disappeared from this jungle from the same cause.

Surendra discalis was formerly very plentiful at Haldummulla, but its food plant, *Acacia cæsia*, has become almost extinct, and the butterfly is now very rare. I believe the *Acacia* was killed out by Lantana.

Appia taprobana was common at Galle in 1918, especially round its food plant, *Crotæra roxburghi*, but I have not seen a single specimen in 1919. In this case I believe the disappearance was due to parasites, but I have no direct evidence.

W. ORMISTON.

PROCEEDINGS OF THE CEYLON NATURAL HISTORY SOCIETY.

Thirtieth General Meeting

THE Thirtieth General Meeting of the Society was held in the Colombo Museum Library on Friday, May 7, 1920, at 5.30 P.M., Dr. A. Nell in the Chair.

A lecture entitled "The Work of a Local Natural History Society" was given by Mr. W. L. Selater, F.Z.S., the Editor of the "Ibis."

Eighth Annual General Meeting.

The Eighth Annual General Meeting of the Society was held in the Colombo Museum Library on July 16, 1920, at 5.30 P.M., Dr. A. Nell, Vice-President, in the Chair.

The accounts and reports of the Honorary Secretaries and Treasurers for 1919 were read and confirmed.

The following office-bearers were elected for the ensuing year:—

Patron : His Excellency the Governor

President : Sir Graeme Thomson.

Vice-Presidents.

F. M. Mackwood, Esq.
Dr. A. Nell.

Dr. Joseph Pearson.
W. E. Wait, Esq.

Council.

The Ven. the Archdeacon of
Colombo.
R. A. Senior-White, Esq.
Rev. Father M. J. Le Goc, O.M.I.

E Evans, Esq.
G. A. Joseph, Esq.
C. T. Symons, Esq.
F. Lewis, Esq.

Joint Honorary Secretaries and Treasurers.

Dr. Joseph Pearson and Mr. C. T. Symons (Acting).

Now Members :—Messrs. R. Somasundaram, E. van Rooyen, S. T. Jeevaratnam, C. T. Chelliah, C. M. Mohamed, G. Amaratunga, R. Caldera, G. Jayawardene, M. A. Paul, W. M. Ramasamy, H. J. Fernando, S. P. Selvadurai, G. M. Dirckze, Mr and Mrs G. P. Madden, and Mr. G. K. Pippet.

Rev. Father Le Goc, O.M.I., gave a lecture on "Plants on the Seashore"

Some exhibits were explained by Dr. Pearson.

Thirty-Second General Meeting.

The Thirty-second General Meeting of the Society was held in the Colombo Museum Library on October 14, 1920, at 5.15 P.M., Dr. A. Nell in the Chair.

New Members :—Messrs. A. H. Malpas and A. J. Wickwar.

A paper on "Notes on a Collection of some Wayside Plants made in Nuwara Eliya" was given by Mr. E. C. T. Holsinger.

Dr. Pearson read a note sent by Dr. Hutson of Peradeniya on Glow-worms attacking the "Kalutara Snail" (*Achatina fulica*).

Dr. Pearson explained a number of interesting exhibits.

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SPOLIA ZEYLANICA.

LUCIOLA NICOLLIERI sp. n. de CEYLAN

PAR E. BUGNION.

(avec deux Planches.)

L'espèce qui fait l'objet de cet article a été trouvée à Ceylan sur la plantation de Talgaswella, à 30 milles environ au nord de Point of Galle.

(C'était en Février 1913. Traversant un soir une petite jungle située près du lac, à 1 mille à peu près du bungalow, je pris d'un coup de filet (presque sans y penser) deux Lucioles qui volaient près du sentier. Arrivé à la maison, je vis avec surprise que ces insectes n'appartenaient pas à l'espèce vulgaire (*L. chinensis*), de couleur testacée, si commune à Ceylan, mais que leurs élytres noirs, leur thorax rouge orange, les rapprochaient plutôt de nos *L. italica* et *lusitanica*. Assez intrigué, je me promis d'en capturer un plus grand nombre.

Ce projet fut exécuté le lendemain. Muni d'un filet de gaze, je retournai au même endroit entre 7 et 8 heures du soir et pus, sans m'écarter du sentier, attraper 34 Lucioles qui toutes répondaient au nouveau type.

Mes sujets appartenaient au sexe ♂. Connaissant mal à cette époque le genre de vie des Lucioles, je n'avais pas pensé à rechercher des femelles.*

* Il ressort des observations de Peragallo (1862, p. 621, et 1863, p. 661) que les Lucioles qui volent le soir auprès des arbres sont exclusivement des ♂. Les femelles, beaucoup plus rares, reconnaissables à leurs yeux plus petits, à leur corps plus large et plus dodu, se tiennent au niveau du sol, cachées sous les herbes ou dans les anfractuosités de la surface. C'est là, qu'après avoir volé pendant les premières heures de la nuit, les ♂ les rejoignent un peu plus tard. Des couples peuvent être observés dès 11 heures. La ♀ n'ayant qu'un pouvoir éclairant très faible, les individus de ce sexe sont, dans d'autres circonstances, difficiles à découvrir. Bien que relatives à l'espèce niçoise (*L. lusitanica*), ces indications s'appliquent probablement aux Lucioles en général.

La capture de *L. nicollieri* dans la localité précitée à l'exclusion de *L. chinensis*, est au premier abord difficile à expliquer. La supposition la plus plausible est que notre insecte vole de préférence dans les sous-bois, à l'intérieur de la jungle, tandis que *L. chinensis* fréquente plutôt les endroits découverts. Les naturalistes de passage à Ceylan évitant d'ordinaire des'attarder dans la forêt après le coucher du soleil, on comprend assez bien que *L. nicollieri* ait échappé à leurs recherches. C'est grâce à une circonstance fortuite, parce que le chemin du retour traversait un bout de jungle, que j'eus l'occasion de découvrir ce nouveau type.*

La faune singhalaise compte une deuxième Luciole assez semblable (élytres et tête noirs, thorax rouge orange avec une tache discoïdale obscure), c'est *L. horni* Bourg. trouvée par le Dr. Horn à Anuradhapura. La description publiée par Bourgeois (1905, p. 128) montre toutefois que *L. horni* diffère par des caractères assez tranchés.

Le type de *L. horni* Bourg. se trouvant à Paris, dans les collections du Muséum, j'ai pu, grâce à l'amabilité de Mr. G. Bénard préparateur, obtenir des indications complémentaires qui, pour ce qui est de la validité de *L. nicollieri*, font tomber les derniers doutes. Voici les principaux passages de la lettre que m'a adressée Mr. Bénard :

"Ayant comparé les deux Lucioles, je puis vous confirmer que votre espèce n'est pas *horni* ; elle diffère de celle-ci par la forme du pronotum et par la coloration. Chez *horni* (sauf les angles antérieurs légèrement arrondis) la forme générale du pronotum est franchement rectangulaire, tandis que, dans votre espèce, elle est trapézoïde.

"Chez *horni*, le pronotum est orné d'une tache noire discoïdale qui laisse de chaque côté une large bordure jaune. Cette bordure n'atteint ni le bord antérieur, ni la base dont elle est séparée par un fin liseré. Chez votre espèce, la coloration du pronotum est d'un jaune orange uniforme.

"Chez *horni*, les élytres sont d'un brun foncé uniforme ; chez votre espèce qui a la même coloration, les élytres sont bordés de jaune.

"Chez *horni*, le dessous du corps est entièrement jaune, tandis que, dans votre espèce, il n'y a que les deux derniers segments qui sont jaunâtres."

* Je dédie cette espèce à mon gendre, E. Nicollier, intendant de la plantation de Talgaswella, en souvenir de la bonne hospitalité qu'il m'a donnée au bungalow.

Description du ♂ (Pl. I., figs. 1 et 2).

Longueur variable : 5-8 mm.

Noir, avec le prothorax, le scutellum, le bout et le bord des élytres, les hanches antérieures et médianes, ainsi que le pourtour du mésosternum, d'un rouge orange.—Les deux derniers segments de l'abdomen d'un jaune testacé brillant, tranchant vivement sur la couleur noire des anneaux qui précèdent. Pattes brunes, avec la face inférieure des cuisses et le bord externe des tibias rougeâtres.—Yeux grands, arrondis, d'un noir opaque, plus rapprochés l'un de l'autre au côté ventral qu'au côté dorsal.

Front largement excavé, couvert de rugosités serrées, noir avec des poils blanchâtres assez courts et clairsemés. Antennes filiformes, noires, velues, insérées près l'une de l'autre. Onze articles : le 1^{er} deux fois plus long que le 2^e, les 3^e et 4^e un peu plus longs que le 2^e, les suivants un peu plus courts que le 4^e, deux fois environ plus longs, que larges. Pronotum transverse, deux fois plus large que long, convexe, avec un sillon médian et une impression transverse au devant du scutellum, de couleur rouge orange avec un liseré noirâtre le long du bord antérieur ; son bord antérieur légèrement arrondi, avec sa partie médiane proéminente, ses bords latéraux à peu près droits, son bord postérieur profondément bisinué, ses angles antérieurs obtus, ses angles postérieurs acuminés et déjetés en arrière.

Surface du thorax marquée de points serrés arrondis, creusés en forme de cupules, avec un poil oblique inséré sur le bord de chaque point (fig. A).

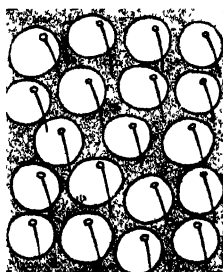


Fig A.—*Luciola nicollieri* ♂. Portion du tégument du pronotum. Préparation au baume. $\times 156$.

Scutellum de même couleur que le thorax, ponctué de même, triangulaire avec le bout arrondi.—Elytres à peine dilatés d'avant en arrière, ensemble trois fois environ plus longs que larges, les épaules assez saillantes, le bord externe, au niveau de l'épaule, replié en dessous et dilaté, les bouts postérieurs insensiblement rétrécis et arrondis. A leur surface se voient 3 lignes élevées assez distinctes (une 4^{ème} obsolète) et, dans les intervalles, des points enfoncés plus distants que les points thoraciques, disposés en séries longitudinales assez régulières. Poils jaunâtres inclinés d'avant en arrière, plus longs et plus serrés vers le bout postérieur. Abdomen dorsal, composé de 7 segments ; les 4 premiers brun foncé, les 3 derniers testacés. Abdomen ventral formé de 6 segments, les 4 premiers brun foncé, les deux derniers testacés et transparents, recouvrant des organes lumineux en forme de plaques.* Dessous du corps finement ponctué, avec une pubescence grisâtre courte et serrée.

Tibias légèrement incurvés, garnis sur le bord externe d'une rangée de poils assez serrés. Premier article des tarses aussi long que 2 + 3; 3 deux fois plus court que 2; le 4^e creusé d'une rainure destinée à loger la base du 5^e; le 5^e étroit, comprimé, avec deux petits ongles un peu renflés à leur base.

* H. v. Kiesenwetter (1863, p. 460) dit au sujet de l'abdomen de la Luciole : "Le côté ventral de l'abdomen se compose chez le ♂ de 6 segments. Le dernier segment, allongé, terminé en pointe, étant souvent transparent, on croit voir un 7^e segment qui en réalité n'existe pas." Cette dernière assertion n'est pas exacte. Le segment que l'on voit par transparence est le 7^{ème} tergite. Il y a en effet chez la Luciole ♂, 7 tergites abdominaux et seulement 6 sternites visibles. Quelques pièces accessoires, attenantes à l'armure génitale, dérivées des segments 7.8 et 9, sont, à l'état de repos, retirées à l'intérieur. Chez la ♀, le côté ventral de l'abdomen est formé de 7 segments. Peut-être même pourrait-on considérer l'oviscapte comme répondant à deux anneaux supplémentaires.

Chez *Lampyris*, le côté ventral de l'abdomen a 8 segments chez la ♀ et 7 seulement chez le ♂. Les écharpes lumineuses de la ♀ se trouvent sur la face ventrale des segments 6 et 7. Chez les larves (*Luciola*, *Lampyris*, *Phausis*), l'abdomen a neuf articles dans les deux sexes, sans compter un 10^e anneau atrophié.

Ceylan, Talgaswella, district d'Elpitiya.

Diffère de *L. horni* Bourg. par ses antennes entièrement noires, son prothorax d'un jaune orange uniforme, ses élytres bordés de jaune orange, le dessous de l'abdomen, à l'exception des deux derniers segments, de couleur foncée.

Distinct de *L. italica* L. par sa forme moins allongée, sa ponctuation plus fine, son pronotum plus court (relativement plus large) avec les angles postérieurs plus déjetés en arrière, ses pattes plus foncées, ses élytres bordés de jaune.

L. lusitanica Charp. diffère de *nicollieri* par sa taille plus forte (11 mm.), son thorax plus large (plus transverse), avec le bord postérieur plus distinctement bisinué, par ses élytres entièrement noirs. Les deux derniers articles ventraux de l'abdomen (♂) ne sont pas testacés comme chez *nicollieri*, mais d'un jaune soufre pâle. Le 3^e article des palpes labiaux est découpé en 5 festons (3 chez *nicollieri*). On constate, en examinant au microscope le pronotum des deux espèces, que les points cupuliformes sont, chez *lusitanica*, beaucoup plus écartés (fig. B).

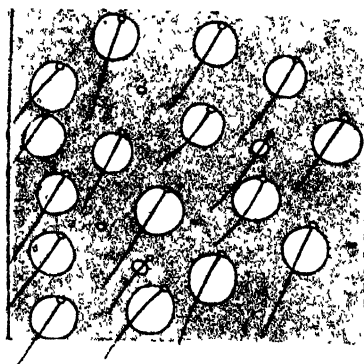


Fig. B.—*Luciola lusitanica* ♂. Portion du tégument du pronotum. Préparation au baume. $\times 156$.

Structure de la tête.

Les yeux de la Luciole ♂ étant très gros, il n'y a, au côté ventral, qu'un étroit espace réservé aux pièces buccales et aux articulations des antennes (figs. 3 et 4). Les parties buccales sont, en suite de ces dispositions, difficiles à préparer. Le procédé qui m'a le mieux réussi consiste à sectionner la tête en deux dans un plan horizontal, et après avoir éclairci dans la potasse caustique, à monter sur le porte-objet les deux moitiés de la capsule. L'avantage de cette méthode est de laisser les pièces *in situ* et d'en obtenir une vue d'ensemble par dessus et par dessous.

Voici, en quelques lignes, la technique que je conseille.

Il faut prendre de préférence des sujets conservés dans l'alcool. Si l'on n'a que des exemplaires secs, on doit préalablement les ramollir dans l'eau chaude.

L'insecte ayant été placé le ventre en haut sur la platine du porte-loupe, on le maintient avec l'index gauche, en laissant la tête seule à découvert. On opère sous la loupe à un grossissement de 8 à 10. La distance focale doit être assez grande pour que l'on puisse passer l'index sous la lentille et manoeuvrer le rasoir commodément.

Tout étant préparé comme il vient d'être dit, on prend le rasoir de la main droite, l'applique un peu en avant de l'insertion des antennes et, pressant doucement, fait pénétrer la lame de façon à sortir sur la face opposée au niveau du trou occipital. C'est surtout la moitié ventrale qu'il importe d'examiner. La coupe, plongée dans la solution potassique, est chauffée pendant quelques instants dans le but de chasser les bulles d'air. Après une immersion dans l'eau qui peut durer 1 à 2 heures, on traite par l'alcool, l'essence de girofle, le xylol ou l'huile de cèdre, et monte dans le baume du Canada.

Examinons d'abord la coupe représentée fig. 3. Les yeux très volumineux ♂ ne laissent entre deux qu'une bande étroite. Allant d'avant en arrière, on distingue les parties suivantes :

(1^o) Le front légèrement creusé ou ensellé ; (2^o) les cadres articulaires des antennes, ovalaires, presque juxtaposés, séparés l'un de l'autre par une lame très étroite ; (3^o) l'épistome, raccourci dans le sens antéro-postérieur, terminé par un bord concave sur lequel est articulé le labre ; (4^o) le labre, relativement petit, limité par un bord antérieur à peu près droit,

enserré entre les parties basales des mandibules ; (5°) les mandibules courbées en forme de faucilles, croisées l'une par dessus l'autre dans la position fermée ;* (6°) l'échancrure gnathale limitée des deux côtés par les apophyses mandibulaires, en arrière par le bord antérieur du basilaire ; (7°) dans le fond de l'échancrure, la saillie médiane destinée à l'insertion du labium et les crochets articulaires auxquels les cardos des maxilles sont attachés.

Le labium et les maxilles (non représentés sur la fig. 3) seront étudiés en s'aidant d'autres figures.

Un détail intéressant à relever est que l'échancrure gnathale aboutit en avant à une 2^e échancrure (*éch. frontale*) dirigée en sens inverse. A droite et à gauche de l'épistome et du labre se voient deux apophyses assez épaisses (*ap. frontales*) qui rejoignant les apophyses mandibulaires (soudées à celles-ci), contribuent à former les cavités articulaires des mandibules.

On voit encore qu'en s'unissant bout à bout, les quatre apophyses forment un cercle complet (*anneau oral*) dans lequel sont logées les pièces buccales. La partie postérieure de l'anneau (désignée sous le nom d'échancrure gnathale) est exactement remplie par le labium et les stipes, la partie antérieure par l'épistome et le labre, la partie moyenne par les mandibules. Celles-ci, très proéminentes, s'ouvrent et se ferment en avant des autres pièces.

Le *labre*, légèrement rétréci dans sa partie postérieure, est limité en avant par un bord à peu près droit, portant quelques poils clairsemés. Chez *L. lusitanica* le labre est surmonté d'une expansion membraneuse qui, proéminent en avant, forme, dans l'intervalle des mandibules, un prolongement triangulaire. Une disposition à peu près semblable s'observe également chez *Lampyris noctiluca*.

Les *mandibules* qui, chez la plupart des Coléoptères, Orthoptères, &c., s'articulent par des articulations doubles (ventrales et dorsales) sont, chez *Luciola*, portées par un condyle unique.

* Des mandibules courbées en forme de faucilles caractérisent également le g. *Phausis*. Chez *Lampyris* au contraire (*L. noctiluca*), les mandibules sont presque droites avec le bout moins acéré,

La courbure des mandibules est régulière, leur pointe assez aiguë. Leur bord externe est, dans sa moitié postérieure, garni de poils obliques, dirigés d'arrière en avant; leur bord interne est glabre. A l'angle postéro-interne se trouve une apophyse assez forte sur laquelle le tendon du fléchisseur est inséré.

Chez *L. lusitanica*, le bord interne des mandibules porte près de la base une saillie garnie de poils, rappelant une disposition qui s'observe chez les larves des *Lampyrus* et des *Phausis*. Une saillie analogue n'existe pas chez *L. nicollieri* (adulte).

La fig. 4 diffère de la précédente en ce que (le rasoir ayant passé plus en arrière), elle montre le basilaire entier avec les parties adjacentes de la capsule. On a représenté au surplus le mentum, les cardos et une partie des stipes.

Le *basilaire* (aussi appelé *gula*) est la partie de la capsule cranienne comprise entre le trou occipital et l'échancrure gnathale. Destiné à supporter le labium, il répond, paraît-il, au sternite du 6ème zoonite de la tête (z. *labial*). Libre chez les Orthoptères (*Blatta*, *Mantis*, &c.), le basilaire est, chez les Coléoptères, toujours soudé aux parties qui l'avoisinent.

Chez *Luciola*, le basilaire est allongé et, d'arrière en avant, graduellement rétréci. Son bord postérieur (confinant au trou occipital) est régulièrement arqué. Son extrémité antérieure forme, chez *nicollieri*, un court pédicule qui, proéminent dans l'échancrure, porte l'insertion du labium sans aucune articulation interposée.

Des deux côtés se voient deux travées chitineuses assez épaisses, de couleur foncée, les *baguettes juxta-basilaires*, dont les bouts antérieurs, proéminents sur le bord postérieur de l'échancrure, forment les petites saillies auxquelles les cardos sont attachés. Destinées à porter les articulations des maxilles, les baguettes juxta-basilaires appartiennent théoriquement au 5ème zoonite de la tête (z. *maxillaire*); les apophyses mandibulaires appartiennent au 4ème.

Le *labium* (fig. C) est représenté par une lame oblongue, élargie en avant, en partie transparente (de structure molle) en partie chitinisée et rembrunie. Il y a une plaque

chitinisée postérieure répondant au mentum (1ère pièce du labium) et deux plaques antérieures répondant au palpigère (2ème pièce), plus exactement aux *squamæ palpigeræ* (décrites par Ganglbauer chez *Calosoma*).

Le *mentum* est une petite plaque brune, arrondie sur les côtés, velue sur sa face libre, avec le bout postérieur distinctement échancré. C'est à son bord postérieur qu'est fixée la tige au moyen de laquelle le labium est attaché au basilare. (Cette tige, très étroite chez *L. Nicollieri*, est, chez *L. lusitanica*, notablement plus large).

Les *squamæ palpigeræ* sont deux plaques de forme oblongue, légèrement rembrunies, velues sur leur face libre, prolongées en arrière par deux cornes atténuées en pointes, portant en avant les articulations des palpes.

Légèrement rétréci à l'endroit où les palpes sont insérés, le labium se termine par deux petits appendices qui vraisemblablement représentent les *lobes terminaux internes*, désignés parfois sous le nom de *glosses*. Ces lobes, atténués en pointe, juxtaposés l'un à l'autre, richement garnis de petits poils, diffèrent suivant celle des faces qui se présente. Observés par dessous, les dits lobes apparaissent comme deux pièces bien détachées, limitées en arrière par les insertions des palpes, tandis que vus d'en haut, ils montrent simplement deux lèvres continues avec les bords latéraux du palpigère et richement garnies de poils. Entre les deux lèvres se trouve au côté dorsal une gouttière destinée à la succion.

Très étroite dans sa partie antérieure, la gouttière du labium s'élargit brusquement dans sa partie moyenne, puis poursuivant son trajet, va s'ouvrir dans le pharynx.

Le *palpe labial*, composé de 3 articles comme chez les Lampyrides en général, se distingue en ceci que l'article terminal, aplati et élargi, de couleur pâle, offre sur son bord libre trois petites dents (festons) séparées par des échancrures bien apparentes.*

* Les festons qui distinguent le 3e article du palpe labial dans le *g. Luciola* ont été signalés par v. Kiesenwetter 1863, p. 459.

Plus dilaté chez *lusitanica*, le 3^e article des palpes labiaux offre, dans cette dernière espèce, cinq dents marginales mieux découpées. Observées au microscope à un grossissement de 70 à 100, ces dents montrent une extrémité tronquée, terminée, semble-t-il, par une membrane amincie ou par un pore. A l'opposé des articles 1 et 2 qui sont hérissés de soies rigides, le 3^e article est garni à sa surface de poils fins et clairsemés.

Les *maxilles* comprennent les parties suivantes : (1^o) la pièce articulaire, (cardo) ; (2^o) la tige (stipes) ; (3^o) le lobe terminal interne (lacinia) ; (4^o) le lobe terminal externe (galea) ; (5^o) le palpe.

Les cardos de la Luciole ont une disposition particulière qui, à ma connaissance, n'a pas encore été décrite. Au lieu d'être, comme chez les Coléoptères en général, placés en arrière des stipes, ils sont d'ordinaire superposés à ces derniers, au côté dorsal.

Observé dans cette position, le cardo offre un bout postérieur tronqué attaché au bord postérieur du stipes ; son bout antérieur porte d'autre part deux prolongements en forme de cornes, dont l'un, interne, s'articule sur le bord de l'échancrure gnathale au niveau de la saillie déjà décrite, tandis que l'autre, externe, donne insertion aux muscles.

Il y a toutefois une position inverse, dans laquelle le cardo est retourné. J'ai sous les yeux une préparation empruntée à *L. lusitanica* dans laquelle le cardo gauche s'est porté en avant, entraînant la maxille entière, tandis que la maxille opposée est en retrait. Je conclus de ces faits que le cardo de la Luciole joue le rôle d'un levier mobile. Basculant sur la saillie articulaire qui le supporte, il transmet à la maxille un mouvement alternatif de pro et de rétropulsion. Les déplacements latéraux, très réduits chez ces insectes à cause de l'étroitesse de l'espace dévolu aux pièces buccales, seraient remplacés par un mouvement de va et vient. Peut-être en mettant l'insecte en plein soleil (la Luciole étant collée sur le porte-objet le ventre en haut) pourrait-on réussir à observer sur le vivant ce singulier mécanisme.*

* Des dispositions analogues existent, d'après mes observations, dans les g. *Phausis* et *Lampyris*.

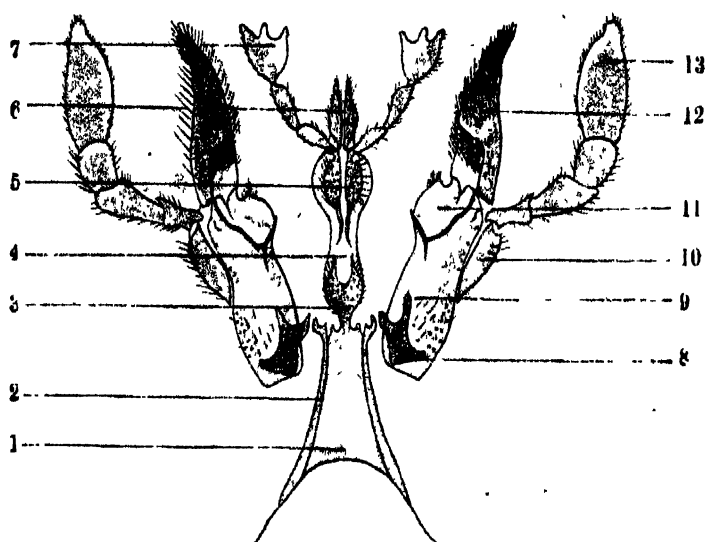


Fig. C.—*Luciola nicollieri* ♂ le basilaire isolé, avec le labium et les maxilles $\times 56$

1 - basilaire; 2 - baguettes juxta basilaires, 3 - épaississement chitineux représentant le menton; 4 - partie membraneuse; 5 - écailles palpigères; 6 - lobes terminaux du labium; 7 - palpes labiaux; 8 - cardo de la maxille; 9 - stipes; 10 - palpifer, 11 - lacinia; 12 - galea; 13 - palpe maxillaire.

Un fait intéressant à noter est que les mouvements alternatifs de pro et de rétropulsion affectant à la fois le labium et les maxilles s'observent également chez les larves des Lampyridés. L'appareil maxillo-labial se retire en arrière, de manière à dégager les mandibules, au moment où celles-ci s'enfoncent dans la chair de l'Escargot, tandis qu'il se porte en avant lorsqu'il doit coopérer à la succion du bouillon nutritif.*

Observés in situ, les stipes se montrent au premier abord sous forme de deux lames étroites, limitées par des bords rembrunis et presque droits. Ce n'est là toutefois qu'une apparence due à un effet de raccourci. Enserées dans un étroit interstice (fig. 4) les maxilles ne sont pas posées à plat, mais dans une direction oblique par rapport au plan frontal. Il faut les isoler, pour pouvoir juger de leur vraie forme.—Étalé sur le porte-objet (fig. 5) le stipes se montre composé de deux parties, une postérieure étroite, une antérieure élargie. La partie postérieure, à peu près quadrilatère, a sur sa face libre quelques poils clairsemés. La partie antérieure montre au niveau de l'angle externe la lame rembrunie, hérissée, de nombreux poils, généralement désignée sous le nom de *palpifer*. Destinée à porter l'articulation du palpe, cette lame peut être comparée à une écaille qui embrasserait le bord externe du stipes. Développée surtout au côté dorsal, elle n'offre au côté ventral qu'un rebord étroit. Sur le bord interne du stipes (à peu près à mi-longueur de la maxille) se trouve une épine assez saillante qui, lorsqu'on observe les pièces buccales in situ, proémine en-dessous des squames palpifères. Au même niveau se voit un arc chitineux qui, coupant l'angle antéro-interne du stipes, surmonté d'une houppe de poils courts, représente à mon sens, la partie postérieure du lacinia.

* La larve de la Luciole (*L. lusitanica*) a des mandibules canaliculées entièrement semblables à celles des *Lampyris* et des *Phausis*. On peut inférer de cette observation que ladite larve se nourrit elle aussi, aux dépens de petits mollusques (Escargots et Limaces), La Luciole adulte ne prend, pouvait-il pas d'aliments.

Le reste du lacinia se trouve, comme le montre la figure C, en avant de cette pièce, encastré dans une échancrure du galea. Le lobe terminal de la maxille serait, d'après cette manière de voir, constitué par deux pièces juxtaposées, l'une plus étendue atténuée en pointe, richement couverte de poils, répondrait au galea, l'autre plus petite, placée à l'angle interne, représenterait le lacinia. Le palpe, bien développé, de couleur foncée, est composé de quatre articles. Le 1er, assez étroit, est deux fois plus long que large ; le 2ème deux fois plus grand que le premier ; le 3ème court et épais ; le 4ème beaucoup plus grand, renflé, terminé en forme de cône ; tous quatre modérément garnis de poils.

Les traits qui caractérisent la tête de la Luciole sont en résumé :

(1°) La grosseur des yeux, surtout dans le sexe mâle, et l'étroitesse de l'espace (interoculaire) réservé aux pièces buccales ; (2°) la présence d'une échancrure frontale qui, venant à la rencontre de l'échancrure gnathale, forme avec celle-ci un anneau complet* ; (3°) l'absence d'une pièce prébasilaire ; (4°) la délimitation imparfaite du mentum et du palpigère, ces deux pièces, incomplètement chitinisées, étant unies l'une à l'autre par une partie membraneuse ; (5°) des cardos disposés de telle manière que les maxilles peuvent, au gré de l'animal, avancer ou reculer ; (6°) des mandibules portées par un condyle unique, de part et d'autre ; (7°) la position proéminente des mandibules et l'absence, en dessous du labre, d'une fente (sinus) destinée à les loger.

Comparées à celles de *L. lusitanica*, les parties buccales de *L. Nicollieri* se distinguent par les caractères suivants :

(1°) Le labium est uni au basilaire par une bandelette étroite formant une espèce de pédicule ; (2°) l'article terminal du palpe labial forme trois festons, au lieu de cinq ; (3°) les

* Une disposition semblable s'observe également chez *Lampyris* et chez *Phausis*, mais avec cette différence que l'échancrure frontale est moins profonde.

Un anneau oral complet existe chez certains Hyménoptères (famille des *Braconides*, groupe des *Dorycetes*), désignés pour ce motif sous le nom de *Cyclostomes*.

cardos sont relativement plus courts ; (4°) l'épine qui surmonte le bord interne du stipes ne proémine que faiblement ; (5°) le labre est limité par un bord antérieur à peu près droit ; (6°) le bord interne des mandibules ne porte, près de sa base, aucune saillie garnie de poils.

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1842. *Charpentier*. *Horæ entomologicæ*, VI., p. 194. fig 4 (*Luciola lusitanica*.)

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1862. *Mulsant*. Mollipennes. *Ann. Soc. Lin. Lyon*, p. 179 *Luciolaires*, et note Suppl., p. 593.

1863. *Kiesenwetter* (H. von). *Naturg. der Insecten Deutschlands*, IV., p. 458. *Luciolidae*.

1880. *Gorham* (Rev. H. S.). On the structure of the Lampyridæ with reference to their phosphorescence. *Trans. entom. Soc., London*.

1884. *Olivier* (Ernest). Révision des Lampyrides. *L'Abeille*, p. 47. (*Luciola*.)

1885. — *Ann. Mus. civ. Genova*, p. 359. (*Luciola chinensis*.)

1886. *Emery* (C.). La luce negli amori delle Lucciole. *Bull. Soc. ent. Italiana Anno XVIII*.

1905. *Bourgeois* (Jules). Voyage du Dr. W. Horn à Ceylan. *Ann. Soc. ent. France*, p. 128. (Descr. de *Luciola horni*.)

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1921. — La Biologie de la Luciole (*Luciola lusitanica*). *Revue d'Hist. nat.-appliquée* No. 1. (janvier).

EXPLICATION DES PLANCHES.

Planche I.

Figs. 1 et 2.—*Luciola nicollieri*, sp. n. de Ceylan. L'insecte ♂ grossi $7\frac{1}{2}$ fois.*

Planche II.

Fig. 3.—*Luciola nicollieri* ♂. La tête sectionnée en deux moitiés. La moitié ventrale éclaircie dans la potasse caustique. Préparation au baume. $\times 45$.

1—tigelle articulaire de l'antenne; 2—épistome; 3—apophyse frontale; 4—labre; 5—mandibule; 6—apophyse mandibulaire; 7—échancrure gnathale; 8—articulation du cardo.

N.B.—Les maxilles et le labium ont été détachés.

Fig 4.—*Luciola nicollieri* ♂. La tête, sectionnée en deux moitiés. La moitié ventrale éclaircie dans la potasse caustique. Préparation au baume. $\times 45$.

1—basilaire ou gula; 2—baguette juxta-basilaire; 3—lestipes de la maxille dans sa position habituelle [Le stipes opposé a été représenté, en propulsion, d'après une préparation empruntée à *L. lusitanica*]; 4—apophyse mandibulaire; 5—partie membranense qui unit le mentum au palpigère; 6—articulation de la mandibule; 7—apophyse frontale; 8—épistome; 9—bord de la fossette antennaire.

N.B.—Les mandibules n'ont pas été dessinées; non plus que les pièces terminales des maxilles et du labium.

* Cette planche a été dessinée et coloriée à l'aquarelle par M^{me} Paul Robin, 103 Avenue de Villers, Paris.

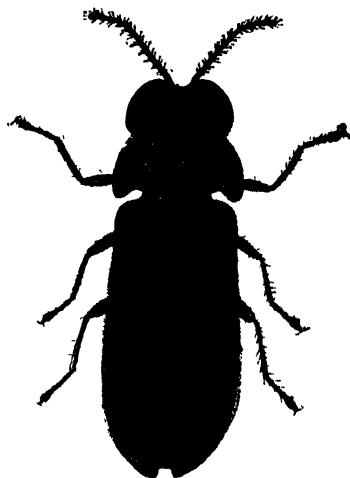


Fig. 1.

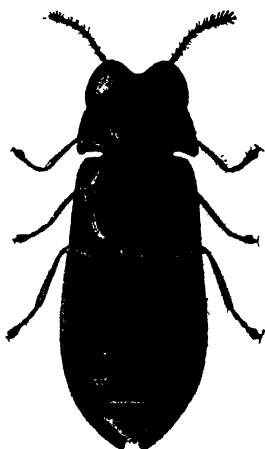


Fig. 2.

LUCIOLA NICOLLIERI sp. n. ♂.

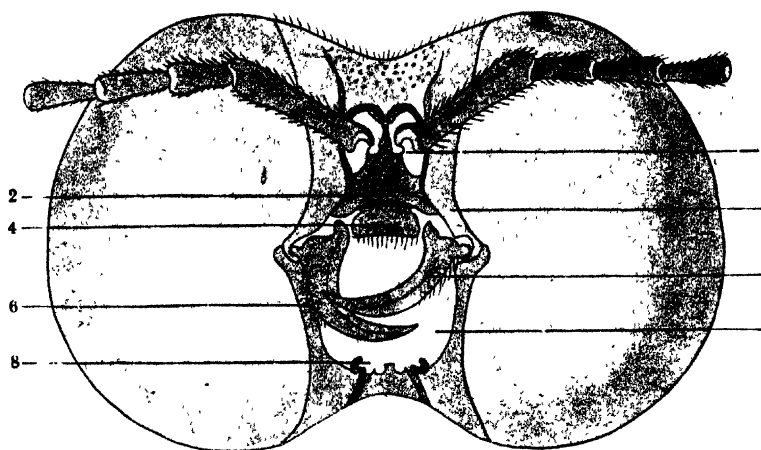


Fig. 3.

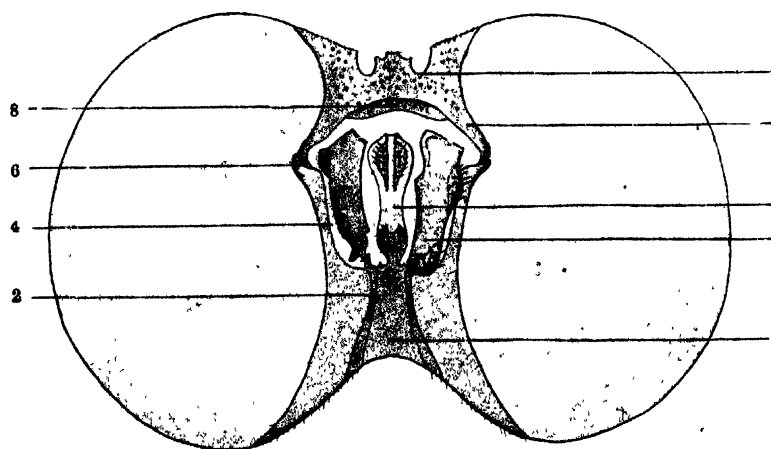


Fig. 4.

LUCIOLA NICOLLIERI, sp. n. ♂.

**A PRELIMINARY ACCOUNT OF THE LAMELLI-
CORNIA COLLECTED IN CEYLON BY PROF.
E. BUGNION DURING THE YEARS 1906
TO 1913.***

By Prof. JOSEPH J. E. GILLET, Brussels, Belgium.

THROUGH Prof. Bugnion's courtesy I have been able to examine numerous specimens of lamellicorn beetles brought home by him after several visits to Ceylon. I give below a list of the species I have identified, with references to the original descriptions. As soon as I have brought together sufficient material, I hope to publish in "Spolia Zeylanica" a monograph of the Lamellicornia of Ceylon :—

Sub-family **Coprinæ.**

Genus **SCARABÆUS.**

GANGETICUS Castelnau (1840), Hist. Nat. Col. II., p. 64.

Balapitiya (low-country). A single specimen taken when flying.

Genus **GYMNOPLEURUS.**

MELANARIUS Harold (1867), Coleopt. Hefte. I., p. 76.

var. **ÆTHIOPS** Sharp (1875) Coleopt. Hefte, XIII., p. 34.

Puwakpitiya (Kelani Valley).

MILIARIS Fabricius (1775), Syst. Entom. App., p. 817.

Puwakpitiya. Several specimens.

KOENIGI Fabricius (1775), Syst. Entom., p. 29.

Balapitiya. Numerous specimens found in human excrement.

* Lists concerning other groups of Ceylon Insects have been published by Bourgeois (Malacodermes and Lymexylonidæ) in Ann. Soc. ent. France, 1909, pp. 423-438, with a colour plate; Forel (Formicidæ) in Bull. Soc. vand. Sc. Nat. (Lausanne), Vol. 44, pp. 1-23, 1908, and Vol. 45, pp. 392-407, 1909; and by Bugnion (Termites de Ceylan). Bull. du Museum, Paris, 1914, 37 pages and 8 plates.

Genus SISYPHUS.

HIETUS Wiedeman (1823), Zool. Mag., II., 1, p. 24.

Puwakpitiya, Seenigoda. Taken in numbers in cow dung.

Genus CATHARSIVS.

MOLOSSUS Linnaeus (1758), Syst. Nat. ed. X., I., p. 347.

Puwakpitiya, Ambalangoda. Common in cow dung (low-country).

PITHECTUS Fabricius (1775), Syst. Entom., I., p. 21.

Puwakpitiya, Ambalangoda, Talgaswella, Peradeniya.
Numerous specimens found in cow dung.

CAPUCINUS Fabricius (1781), Spec. Ins., I., p. 25.

Ambalangoda, Talgaswella.

Genus COPRIS.

REPERTUS Walker (1858), Ann. Mag. Nat. Hist. (3), II., p. 208.

Puwakpitiya, Ambalangoda, Peradeniya. In cow dung.
Taken in numbers.

TAPROBANUS Gillet (1910), Notes Leyden Mus., XXXII., p. 9.

Precise locality not recorded. Two specimens.

SIGNATUS Walker (1858), Ann. Mag. Nat. Hist. (3), II., p. 208.

Puwakpitiya, Upper Kelani, Peradeniya.

Genus ONITIS.

DISTINCTUS Lansberge (1875), Ann. Soc. Ent. Belgique, XVIII.,
p. 138.

Puwakpitiya, Ambalangoda. Common in low-country.

Genus DREPANOCERUS.

SETOSUS Wiedeman (1823), Zool. Mag., II., 1, p. 19.

Puwakpitiya, Seenigoda. Numerous specimens in excrement.

Genus ONITICELLUS.

RHADAMISTUS Fabricius (1775), Syst. Entom. I., p. 22.

Hambantota. Captured by W. Morton.

Genus CACCOBIUS.

VULCANUS Fabricius (1801), Syst. El., I., p. 41.

var. *indicus* Harold (1867) Coleopt. Hefte., II., p. 12.

Puwakpitiya. Taken in numbers.

ATERRIMUS Harold (1867), Coleopt. Hefte, II., p. 9.

Genus ONTHOPHAGUS.

PUSILLUS Fabricius (1798), Ent. Syst. Suppl., p. 36.

Puwakpitiya.

CENTRICORNIS Fabricius (1798) Ent. Syst. Suppl., p. 33.

Puwakpitiya.

PARVULUS Fabricius (1798) Ent. Syst. Suppl., p. 36.

Trincomalee, Bandarawela, Puwakpitiya.

POLITUS Fabricius (1798), Ent. Syst. Suppl., p. 35.

Trincomalee. A single specimen.

FUSCOPUNCTATUS Fabricius (1798), Ent. Syst. Suppl., p. 36.

Low-country (no locality recorded). A single specimen.

MILITARIS Boucomont (1914), Ann. Mus. Civ. Genova (3), VI., p. 234.

Puwakpitiya, Mount Lavinia. Some specimens only.

QUADRIDENTATUS Fabricius (1798), Ent. Syst. Suppl., p. 34.

Peradeniya. Two specimens.

FURCULUS Fabricius (1798), Ent. Syst. Suppl., p. 33.

Trincomalee, Puwakpitiya. Taken in numbers.

PYGMÆUS Schaller (1783), Abh. Hallisch. n. Ges., I., p. 239.

Galle, Seenigoda, Puwakpitiya. Taken in numbers.

DIMINUTIVUS Walker (1858), Ann. Mag. Nat. Hist. (3), II., p. 208.

Puwakpitiya. A single specimen.

DAMA Fabricius (1798), Ent. Syst. Suppl., p. 32.

Puwakpitiya, Ambalangoda, Point de Galle, Peradeniya.

Very common and widely distributed species.

SPINIFEX Fabricius (1781), Ipec. Ins., I., p. 29.

Puwakpitiya. Two specimens.

RECTECORNUTUS Lansberge (1883), Notes Leyden Mus., V., p. 49.

Puwakpitiya.

CERVUS Fabricius (1798), Ent. Syst. Suppl., p. 31.

Puwakpitiya, Mount Lavinia, Ambalangoda. Taken in considerable numbers.

TARBATUS Walker (1858), Ann. Mag. Nat. Hist. (3), II., p. 209.

Puwakpitiya, Peradeniya. Numerous specimens found in cow dung.

UNIFASCIATUS Schaller (1783), Abh. Hallisch. n. Ges., I., p. 240.

var. **PROLIXUS** Walker (1858) Ann. Mag. Nat. Hist. (3), II., p. 208.

Puwakpitiya, Peradeniya, Talgaswella. Taken in numbers.

DIFFICILIS Walker (1858), Ann. Mag. Nat. Hist. (3), II., p. 209.

Trincomalee. Numerous specimens in cow dung.

BONASUS Fabricius (1775), Syst. Entom. I., p. 23.

Trincomalee. Taken in some numbers.

CRYPTOGENUS Boucomont (1914). Ann. Mus. Civ. Genova (3), VI., p. 216.

Puwakpitiya. A single specimen.

TRITINCTUS Boucomont (1914), Ann. Mus. Civ. Genova (3), VI., p. 217.

Puwakpitiya.

Sub-family **Aphodinae**.

Genus **APHODIUS**.

CRENATUS Harold (1862), Berl. Ent. Zeit., p. 141.

Ambalangoda.

AMGENUS Boheman (1857), Ins. Caffr., II., p. 354.

Bandarawela.

var. **PALLIDICORNIS** Walker (1858), Ann. Mag. Nat. Hist. (3), II., p. 207.

Peradeniya, Puwakpitiya, Upper Kelani.

var. **VESTITUS** Boheman (1857), Ins. Caffr., II., p. 359.

Ambalangoda.

MÆSTUS Fabricius (1801), Syst. El., I., p. 78.

Puwakpitiya.

CARINULATUS Motschulsky (1863), Bull. Moscou, II., p. 461.

Puwakpitiya.

Genus **ATÆNIUS**.

CEYLONENSIS A. Schmidt (1912). Arch. Naturg., Jahrg. 78.
Abtheil. A., p. 199.

Talgaswella. A single specimen.

Genus **PSAMMOBIUS**.

INDICUS Harold (1877), Ann. Mus. Civ. Genova, X.,
p. 100.

Ceylon (no precise locality recorded). One specimen.

Genus **RHYSSEMUS**.

GRANULOSUS Ballion (1871), Bull.-Moscou, II., p. 154.

Peradeniya, Hantana Hills.

Sub-family **Troginae**.Genus **TROX**.

INCLUSUS Walker (1858), Ann. Mag. Nat. Hist. (3), II.
p. 208.

Puwakpitiya.

Sub-family **Orphninae**.Genus **ORPHENUS**.

MYSORIENSIS Westwood (1846), Trans. Ent. Soc., London,
p. 178.

Ambalangoda, Talgaswella, Peradeniya.

PICINUS Westw. (1846), Trans. Ent. Soc., London, IV.,
p. 176.

Ambalangoda.

Genus **PHÆOCHROUS**.

EMARGINATUS Castelnau (1840), Hist. Nat. Col., II., p. 109.

Ambalangoda. Several specimens under a dead PYTHON
MOLURUS Gray.

Sub-family **Dynastinae**.Genus **HETERONYCHUS**.

PUNCTOLINEATUS Fairmaire (1893), Ann. Soc. Ent. Belgique, XXXVII., p. 313.

Seenigoda. A single specimen.

Genus **ALISSONOTUM**.

PICEUM Fabricius (1775), Syst. Entom., I., p. 14.

Ceylon (no precise locality recorded). One specimen only.

Genus **PHYLLOGNATHUS**.

DIONYSIUS Fab. (1792), Ent. Syst., I., 1, p. 20.

Puwakpitiya, Seenigoda. Twelve specimens.

Genus **ORYOTES**.

RHINOCEROS Linnaeus (1758), Syst. Nat. ed., X., I., 2, p. 544.

Everywhere in low-country, the larva in vegetable mould, the adult insect, especially in the sprout of young coconut trees (very destructive).

Genus **EOPHILEURUS**.

CINGALENSIS Arrow (1908), Trans. Ent. Soc., London, 1908, p. 333.

Matale. A single specimen.

Sub-family **Cetoniinae**.Genus **HETERORRHINA**.

ELEGANS Fabricius (1781), Spec. Ins., I., p. 56.

Puwakpitiya, Talgaswella.

var. **ANTHRACINA** Westwood (1848), Cab. Or. Ent., p. 36, pl. 17, f. 7.

Puwakpitiya.

Genus CLINTERIA.

IMPERIALIS Paykull (1817), Schönh. Syn. Ins., I., 3, App., p. 58.

Colombo, Peradeniya (in rotten wood), Hantana.

CHLORONOTA Blanchard (1850), Cat. Collect. Ent. Paris, p. 38.

QUATUORDECIMMACULATA Fabricius (1792), Ent. Syst., I., 2, p. 150.

Genus MACRONOTA.

QUADRIVITTATA Schaum (1848), Trans. Ent. Soc., London, V., p. 68, pl. 2, f. 4.

Talgaswella.

Genus PROTÆTIA.

AURICHALCEA Fabricius (1775), Syst. Entom., I., p. 49.

Ambalangoda.

WHITEHOUSEI Schaum (1848), Trans. Ent. Soc., London, V., p. 72, pl. 11, f. 3.

A single specimen.

ALBOGUTTATA Vigers (1826), Zool. Journ., II., p. 238, pl. 9, f. 3.

Genus OXYCETONIA.

VERSICOLOR Fabricius (1775), Syst. Entom., I., p. 51.

Hirimbura, near Galle.

var. CRUENTA Pallas (1781), Icones Ins., p. 21, pl. B, f. A 24.

var. VARIEGALA Fabricius (1775), Syst. Entom., I., p. 51.

Puwakpitiya.

Genus ANTHRACOPHORA.

CRUCIFERA Olivier (1789), Entom., I., 6, p. 39, pl. 5, f. 29.

Genus CÆNOCHILUS.

TAPROBANICUS Westwood (1874), Thes. Ent. Oxon., p. 46, pl. XII., f. 8.

Seenigoda.

A single male was found in a subterranean nest of *TERMES HORNII*, Wassmann.

THE PASSERINE BIRDS OF CEYLON.

By W. E. WAIT, M.A., F.Z.S.

(*With two Plates.*)

THE present paper completes the rough draft for the proposed Handbook on the Birds of Ceylon, and as soon as it appears in print, I shall be able to undertake the task of revision for publication in volume form. The *Passeres* were originally to have been described by Mr. W. A. Cave. As, however, during the whole period of the war Mr. Cave was engaged on local military duties, in addition to his own professional work, and as soon after his demobilization he left the Island, he was unable to finish the task. Before his departure he handed over to me descriptions, in practically complete form, of the first sixty species. Consequently this instalment owes much to his preparation.

It is now over six years since the scheme for the Handbook was first proposed, but the unavoidable delay caused by the war has not been without advantages. Mr. E. C. Stuart Baker, the recognized authority on the ornithology of the Oriental region, is at present bringing out in the Journal of the Bombay Natural History Society a revised list of the Birds of India on a trinomial classification. It will, therefore, be possible to take advantage of the latest classification when publishing the Ceylon Handbook.

Thirty years ago, when Oates and Blanford wrote their standard work on the Birds of British India, the binomial system, founded by Linnæus in the middle of the eighteenth century, was still universally used in all branches of Natural History. That is, each species was described scientifically by its generic and specific names. For instance, the House Sparrow was known as *Passer domesticus*. Since then, however, ornithological workers, especially field workers, have

gradually realized that this classification was hardly sufficient in the case of many widely distributed species. It was apparent, for example, that with many birds which ranged all over the Indian Empire forms from the deserts of North-West India differed noticeably and constantly, on the one hand, from the forms met with in the Himalayas, and, on the other hand, from those found in Ceylon or Southern Burma, though each geographical race passed into the next by the most gradual transitions throughout the intervening areas. Under the old binomial system all these geographical races had either to be lumped together under one specific name, or split into a variety of species with very minor distinctions. Sometimes one course was adopted, sometimes the other. In Oates' and Blanford's "Birds of British India" the geographical races of the Madras Red-vented Bulbul, which is found practically all over India and Burma, are divided into six different species. On the other hand, the common Indian Crow Pheasant, in which there are several well-marked geographical races, is treated as one species.

To meet the situation, modern ornithologists, wherever necessary, have adopted a trinomial classification, which enables them to differentiate sub-species. For the definition of a sub-species I quote Mr. Stuart Baker: "A sub-species is a geographical race or variation differing in some respect from the form first described as the species, yet linked to it by other intermediate forms found in intervening areas. It is essential, however, that to entitle such a variation to a trinomial, it should have arrived at a point in its evolution sufficiently advanced to enable it to exist as a permanent form within some definite area. From this it will be seen that a sub-species is merely a term for a species in the making."*

The principle on which the system is worked may be explained briefly as follows: Where it is necessary to divide a species, the sub-species identical with the form from which the species was originally described is expressed by repeating the specific name; the new sub-species is given an appropriate

* "Sub-species and the field Naturalist." *Journal of the Bombay Natural History Society*. May, 1919. Vol. XXVI., part 2, p. 518.

sub-specific name. Thus, if one wishes to describe as a new sub-species the Ceylon form of the Magpie Robin—*Copsychus saularis*—it may be shown as *C. saularis ceylonensis*. The Indian form, to which the name *C. saularis* was first applied, would become *C. saularis saularis*. Where two or more forms originally ranked as separate species are to be re-grouped as sub-species, the form which has the oldest scientific name takes precedence. Thus, the Common Indian Mynah and the Ceylon Mynah, formerly ranked as separate species—*Acridotheres tristis* and *A. melanosternus*—are now considered to be merely sub-species of the same bird. *A. tristis* was named by Linnæus in 1766, *A. melanosternus* by Legge in 1879. The Indian form, therefore, becomes *A. tristis tristis*, and the Ceylon form *A. tristis melanosternus*.

At the beginning of last year Mr. Stuart Baker kindly furnished me with a manuscript list of the Ceylon *Passeres*, showing several modifications made in the family groups since the time of Oates, and also giving the trinomials of Ceylon forms as far as he had then worked them out. In order not to delay this instalment I have followed this admittedly incomplete and tentative list, but there is no doubt that Mr. Baker's catalogue, when completed and printed, will contain a good many further modifications. As I have already noted, the Ceylon Handbook in its volume form will follow Mr. Baker's classification as eventually published.

Order **PASSERES.**

Passerine Birds.

For all the wide diversities of size, colour, and outward form, the whole range of birds is wonderfully alike in general structure, and the differences between the most divergent ornithological orders are not nearly so great as those between even nearly allied orders of mammals. The structural keymarks distinguishing the *Passeres* lie in the formation of the bones of the palate and in the two tendons which run down the leg and serve the toes. These two tendons, known

as the deep plantar tendons, vary in their disposition. They are said to be Passerine when the one tendon serves the three front toes and the other the hind toe, both tendons being wholly disconnected in such a manner that the hind toe is mobile and worked independently of the other three. All the *Passeres* are also characterized by possessing an arrangement of the bones of the palate known as "ægithognathous." The combination of Passerine deep plantar tendons with the above-mentioned form of palate will always serve to distinguish the *Passeres* from any other order. I do not propose, however, to go further into these structural characters, as it is not a difficult matter to diagnose all Ceylon forms of the order by outward marks, as follows.

They are all birds of medium or small size ; with the single exception of the crow family, they never run larger in the body than a Thrush or Mynah, and are frequently smaller. The young when hatched are in a helpless and almost naked condition, being clothed at first merely with a few isolated patches of down. The bill is never furnished at the base with a cere, or membrane of soft skin. The legs are feathered down to, but no further than, the tarsal joint. Lastly, the outward structure of the feet is typically constant. The first, or hind toe, also known as the hallux, is always present, and is movable independently of the three front toes, while the front toes are separated from each other down to their bases. Compare, for instance, a crow—a Passerine bird—with an Indian Roller, often erroneously called a Blue Jay. Both birds are of the same size and build, but in the Roller the middle front toe is united to the outer toe at the extreme base, and to the inner toe for the length of the first joint. Again, in certain other orders, such as the Cuckoos, the feet are "zygodactylic," i.e., two toes only are turned to the front, while the first and fourth toes are directed backwards.

The *Passeres* are by far the largest order of birds, comprising at least half of all the living species. They are also generally acknowledged to be the most specialized and most highly organized order. In other words, at the present general stage of evolution, they are the dominant ornithological order, and, as Darwin has pointed out, dominant groups show the

greatest tendency to variation. As a consequence, though there are many exceptions, the average Passerine species are confined to smaller areas than less specialized and more widely distributed species and sub-species of other orders. This is well shown by a comparison of the list of birds found within the wide area of the Indian Empire with the list of our smaller area in Ceylon. In the Indian list the Passerines occupy a full half. In the Ceylon list, however, we find that only one-third of our birds or about 120 species are Passerine. It is not so much that Ceylon, taking into account its varieties of climate and configuration, is remarkably poor in birds of the order, but that a very large proportion of the Indian forms are confined to restricted areas, being replaced in other areas within the Empire by different, but closely allied, species and sub-species.

With such a large assemblage of forms belonging to a single order and possessing the same main structural characters, the task of classification is extraordinarily difficult, and few ornithologists agree in all particulars regarding the grouping of the various species into families, or the sequence in which the families themselves should be arranged. The order is divided primarily into two main groups, based on a difference in the structure of the syrinx, or organ of voice. In the *Acromyodi* the intrinsic muscles of the syrinx are attached to the ends of the open rings of the bronchial tubes; in the *Mesomyodi* these muscles are much simpler, and are attached to the middle of the rings. This division need not, however, greatly trouble the Ceylon student. The *Mesomyodi* are found mainly in the New World, and only one species of the group, the Indian Pitta—*Pitta brachyura*—occurs in Ceylon. It happens to possess a very distinctive plumage, and is also to be diagnosed by the formation of the wing. It has ten primary wing quills,* and the first primary is nearly as long as the second. Many Ceylon *Passeres* have ten primaries, but in every other such case the first primary is markedly small.

* The primary quills are those which spring from the pinion—i.e., the outer portion of the wing, beyond the "elbow," which is really the joint corresponding to the wrist.

As regards the *Acromyodi*, I propose to follow the classification given by Oates in volumes I. and II. on Birds in the Fauna of British India, making, however, one or two modifications communicated by E. C. Stuart Baker. According to this classification, twenty families belonging to the group are found in Ceylon. Some of these families may be marked off by clear, though minor, structural characters. For instance, the Larks have the hinder side of the tarsus scutellated ; the Sun-birds and Flower-peckers have the edges of the bill serrated ; the Swallows, Wagtail family, and the Sparrows have only nine primaries ; while the Weaver-bird family and the Sparrows have conical bills, in which the nostrils are set very far back, and lie nearer to the ridge than to the cutting edge of the mandible. The remaining families, however, all possess ten primaries, the first being small, and no structural differences sufficient or constant enough to serve as sharply defined lines of division. Oates, therefore, fell back on a system of grouping according to the types of plumage normally found in the young of each family. He recognized five main groups. In the first the nestling resembles the adult female, but is paler ; in the second it is more brilliant than the adult female, and is generally suffused with yellow ; in the third it is transversely barred ; in the fourth streaked ; in the fifth it is mottled or scaly-patterned. In certain genera, however, the young are exceptions to the normal family rule. For instance, some nestling Flycatchers and Thrushes are plain and not mottled.

I give below a short synopsis of the Passerine families found in Ceylon. Where possible, in addition to the structural points, I have given short remarks on distinctive characters of form, colour, and size, which will render identification more easy for the beginner ; but it must be remembered that in some cases these latter distinctions hold good only for the limited number of forms occurring in this Island. I hope that this synopsis, taken in conjunction with the short descriptions given in the text at the beginning of each family and sub-family group, will enable beginners to get a fair grasp of the different families belonging to this order, which are found within our limits.

Synopsis of Passerine Families found in Ceylon.

ACROMYODI.

A.—Wing with ten primaries, the first being small ; edges of mandibles not serrated ; hinder part of tarsus smooth ; nostrils clear of line of forehead.

(a) Plumage of nestling resembles that of adult female, but paler.

(1) Nostrils completely hidden by bristles ; first primary over $\frac{1}{2}$ length of second ; size large, length over 16 inches. *Corvidæ* (Crow family)

(2) Nostrils completely hidden by bristles ; first primary not over half length of second ; size small, length $5\frac{1}{2}$ inches. *Paridæ* (Tits)

(3) Nostrils bare or overhung only by a few hairs or plumelets ; inner and hind toe equal ; size medium or small. *Crateropodidæ* (Babblers, Bulbuls, and their allies)

(4) Nostrils overhung by a few hairs ; climbing birds ; hind toe much longer than inner ; size small. *Sittidæ* (Nut-hatches)

(5) Tail forked and with only ten feathers ; plumage mainly black. *Dicruridæ* (Drongos)

(b) Plumage of nestling resembles that of female, but brighter.

(1) Size smallish, seldom reaching $7\frac{1}{2}$ inches. Plumage generally plain. *Sylviidæ* (Warblers)

(c) Plumage of nestling cross-barred.

(1) Size variable ; bill strong, hooked, and notched. *Laniidæ* (Shrikes)

(d) Plumage of nestling normally streaked.

(1) Rictal bristles present ; size medium ; plumage bright yellow and black. *Oriolidæ* (Orioles)

- (2) Rictal bristles present ; size *Eulabetidæ*
medium ; plumage mainly glossy (Grackles)
black.
- (3) No rictal bristles ; size medium .. *Sturnidæ*
(Mynahs and
Starlings)
- (e) Plumage of nestling normally streaked
or scaly-patterned.
- (1) Nostrils covered by horizontal *Muscicapidæ*
hairs ; size variable ; legs and (Flycatchers)
feet weak.
- (2) Nostrils not covered by horizontal *Turdidæ*
hairs ; size medium ; legs and (Thrushes)
feet fairly stout.
- B.—Wing with either nine or ten primaries ;
edges of mandibles not serrated ;
hinder part of tarsus smooth ; bill
conical, the nostrils pierced within
line of forehead and closer to the ridge
of the bill than to the cutting edges.
- (1) With ten primaries, the first *Ploceidæ*
small ; size small or very (Weaver Bird
small. family)
- (2) With nine primaries, the first *Fringillidæ*
and second nearly equal ; (Finches and
size small. Sparrows)
- C.—Wing with nine primaries, the first and
second nearly equal ; edges of man-
dibles not serrated ; hinder part of
tarsus smooth ; bill not conical.
- (1) Wings long and pointed ; in *Hirundinidæ*
the folded wing the longest (Swallows)
secondaries fall far short
of the tips of the primaries.
- (2) In the folded wing the longest *Motacillidæ*
secondaries reach almost to (Wagtails and
the tips of the primaries. Pipits)

- D.—Hinder part of tarsus scutellated ; wing in all Ceylon forms with ten primaries, the first being small. *Alaudidæ* (Larks)
- E.—A white ring of small close-set feathers round the eye ; tongue split into two, each half broken up into a bunch of brush-like fibres ; size very small. *Zosteropidæ* (White-eyes)
- F.—Bill with the terminal third of both mandibles finely serrated ; size very small.
- (1) Bill long, curved, and cylindrical. *Nectariniidæ* (Sunbirds)
- (2) Bill short and triangular . . . *Dicæidæ* (Flower-peckers)

MESOMYODI.

Wing with ten primaries, the first being large . . *Pittidæ* (Pittas)

Family CORVIDÆ.

Crows, &c.

The *Corvidæ* are the first of a group of five families found in Ceylon, in which the plumage of the nestling resembles that of the adult female. Structurally they differ from the *Paridæ*—Tits—in that the first primary is considerably over half the length of the second, and, from the other three families of the group, in that the nostrils are completely hidden by feathers and bristles instead of being bare or only partially concealed. The *Corvidæ* are represented in Ceylon by three birds : the two familiar species of crow and the beautiful Ceylon Jay, or more properly Magpie, which is found only in the hills. They are our largest Passerine birds. The bill is fairly powerful ; the nostrils are clear of the line of the forehead and are protected by horizontal bristles ; the legs and feet are stout, the back of the tarsus is smooth, the front scutellated—i.e., covered with shield-like plates—the hind toe is well developed,

but inferior in length to the middle toe. The sexes are alike, and there is only one moult, in the autumn. The plumage of the nestling is paler than that of the adult.

In the genus *Corvus* the plumage is mainly black ; the bill is slightly curved at the tip, but not notched ; the nostrils lie far forward, and the bristles which conceal them are long and stiff ; the wings are long and pointed ; the tail moderate and rounded. In the genus *Cissa* the plumage is brightly coloured ; the bill has a perceptible notch at the tip ; the nostrils are near the base of the bill, and the concealing bristles are rather soft and short ; the wings are short and rounded, and the tail long and graduated.

Key to Ceylon Corvidæ.

1.—Plumage mainly or wholly black, genus *Corvus*.

(a) Wholly black.

Corvus coronoides culminatus (The Black Crow).

(b) Neck dark smoky-gray.

C. splendens protegatus (The Ceylon House Crow).

2.—Plumage mainly bright blue and chestnut.

Cissa ornata (The Ceylon Magpie).

CORVUS CORONOIDES CULMINATUS.

The Black Crow.

Corvus macrorhynchos (Oates, Vol. I., p. 17) ; *Corone macrorhynchos* (Legge, p. 346).

Description.—Entire plumage black ; hind-neck and sides of neck glossless ; scapulars, wing coverts, rump, and outer tail feathers glossed with purple ; throat and breast glossed with dark steel blue ; the bases of the body feathers light smoke gray in birds from the dry districts, darker and brownish in birds from the wet zone. Pied and albino specimens are met with occasionally, and one bird in the Colombo Museum is a pale smoky-brown, slightly darker on the back and abdomen.

Bill black ; iris hazel brown ; legs and feet black. Dimensions rather variable : average length about 18 ; wing 11·5 ; tail 7 ; tarsus 2·1 ; bill from gape 2·25. Males are rather larger than females.

Distribution.—Found all over the low-country, except on the strip round the coast line, where it is largely replaced by the next species. Above 2,000 feet its numbers diminish, and in most localities over about 4,000 feet it appears merely as a casual visitor, but sometimes in fair numbers. The sub-species found in Ceylon occurs over a large part of India. Allied sub-species are found in Australia, South-eastern Asia, China and Japan.

Habits.—This Crow is fairly abundant, but is not nearly so gregarious as the next species. In the villages and jungles it is seen usually in pairs, but in the inland towns it may be met with in greater numbers. It is fairly omnivorous, feeding on all sorts of garbage and carrion, and is a great egg thief. The breeding season is from June till August. The nest is a large structure of twigs placed high up in a tree, or on the crown of a coconut palm. There is a fairly substantial rough lining of coconut fibre, or of grass, fine roots, wool, &c. The eggs, three or four in number, are longish ovals, as a rule slightly pointed at one end. The ground colour is light green, at times with a blue or gray tinge, speckled with brown and more washy under-markings of brownish-gray. Average size 1·63 by 1·12.

CORVUS SPLENDENS PROTEGATUS.

The Indian House-Crow.

Corvus splendens (Oates, Vol. I., p. 20) ; *Corone splendens* (Legge, p. 349).

Description.—Forehead, crown, and lores glossy black ; chin and throat black with a slight steel-blue gloss ; back, wings, and tail black glossed with purple and greenish ; the nape, ear coverts, the sides and back of the neck dark smoky-gray ; the breast darker, almost black ; remainder of lower

parts dull black, with a slight greenish gloss ; the bases of the body feathers white. Birds from the dry districts appear to be quite as dark as those from the wet zone. Pied and albino specimens are occasionally seen. Young birds are duller and less glossy.

Bill black ; iris dark brown ; legs and feet black. Dimensions a little variable. Length about 16·5 ; wing 10·5 ; tail 6·25 ; tarsus 1·9 ; bill from gape 1·9.

Distribution.—Found all round the coast, except, perhaps, in the waste tract between Hambantota and Arugam Bay, but never far inland. Various geographical races of this Crow are found throughout India and Burma. The form occurring in Ceylon is now recognized as a distinct sub-species. Unlike its Indian relatives, the Ceylon form is never found far from the sea. In Legge's time it was rare even on the coast south of Kalutara on the west and Arugam Bay on the east ; but nowadays it is common, at any rate as far east as Hambantota. It is especially numerous in the towns and villages throughout its range, but generally avoids uninhabited stretches of coast line. Where found in any numbers, it has driven out the Black Crow. The curious distribution of the two species is well seen in the Tangalla district of the Southern Province. In the coastal bazaars, such as Tangalla and Ranna, and at Weeraketiya and other villages, about 8 miles inland, the present species occurs ; whereas in the intervening fields and chena tracts the Black Crow still holds its own.

Habits.—The House Crow is even more omnivorous and far more gregarious than the last species, while its cunning and thievish impudence are well known to all Colombo residents. The breeding season is from May to August, but mainly in May and June. The nest is similar to that of the Black Crow, but the birds generally build in scattered rookeries. The eggs, generally four in number, are oval, slightly pointed at the smaller end. The ground colour is usually brighter than in those of the last species, the markings are darker and more profuse, while the under-markings are seldom so noticeable, and are at times altogether absent. Average size 1·4 by 1·06.

CISSA ORNATA.

The Ceylonese Magpie.

Cissa ornata (Oates, Vol. I., p. 29 ; Legge, p. 353).

Description.—Head, neck, upper breast, and upper back rich glossy chestnut ; rest of body royal blue, shading into lighter blue on the lower back, flanks, and abdomen ; the wing coverts shade from the hue of the back into dull brown, faintly washed with blue, on the primary coverts ; wing quills chestnut on the outer, blackish-brown on the inner webs, the inner webs of the tertiaries deep blue ; thighs dusky-brown washed with royal blue ; tail deep blue, the outer edge of the outside feathers and the tips of all the feathers white with a more or less irregular patch of black between the blue portion and the white tips.

In young birds the tail is much shorter and the plumage paler.

Bill, legs, and feet coral red ; iris light brown ; eyelids red and wattled at the edges, orbital skin rather paler.

Length about 18·25 ; wing 6·5 ; tail 10·5 ; tarsus 1·7 ; bill from gape 1·6.

Distribution.—Peculiar to Ceylon. It is confined to the hills, but in the damp south-west districts it is found as low down as 1,000 feet. It probably visits the lower ranges only in the north-east monsoon.

Habits.—A shy bird which goes about in small parties and keeps to heavy jungle. It spends most of its time in the branches of tall trees, but also frequents the undergrowth in search of lizards and beetles, which together with wild fruits form its food. The cry is said to resemble the clanking of a loose connecting rod on a locomotive. It appears to breed in the higher hill ranges during the north-east monsoon. The nest is placed in the top of a tree and much resembles that of a crow, but is not so carelessly put together. The eggs are bluish-green, thickly spotted all over with light umber-brown over larger under-markings of bluish-gray. Size about 1·3 by ·98.

Family PARIDÆ

Genus **Parus**.*Tits.*

Oates in the "Fauna of British India" treats the Tits as a sub-family of the *Corvidæ*, but by most ornithologists they are raised to the rank of a family. As in the *Corvidæ*, the nestling plumage resembles that of the adult, though paler, and the nostrils are concealed by bristles. The first primary, however, does not exceed half the length of the second.

Tits are found over the greater part of the globe; but only one representative, the gray Tit, so familiar to up-country residents, is found in Ceylon. They are all small birds, and bear a great family resemblance. The bill is short and conical, and, though somewhat curved, is not hooked at the tip. The rictal bristles are short, those concealing the nostrils short and thick. The wings are weak and rounded. The legs and feet are fairly stout. In the genus *Parus* there is no crest, and the tail is slightly rounded. In their habits all Tits are more or less alike, going about in pairs or small parties, and roaming actively about the trunks and branches of trees in search of the insects and seeds on which they feed.

PARUS MAJOR MAHRATTARUM.

The Indian Gray Tit.

Parus atriceps (Oates, Vol. I., p. 46; Legge, p. 557).

Description.—Head, neck, and chest black, save for a broad white patch on the cheeks and ear coverts; a broad band of black runs down the centre of the breast and abdomen; the nape is bordered behind by a whitish patch; the rest of the back, the scapulars, rump, and the wing coverts bluish-gray, the greater wing coverts edged with gray and broadly tipped with white; wing quills blackish-brown, the longer primaries narrowly and the tertiaries more broadly edged with white; upper tail coverts deep bluish-gray; tail black, the outer feathers white with broad black inner margins and black shafts; the sides of the breast and abdomen whitish, deepening on the flanks to the hue of the back; under tail coverts black in the centre, white at the edges.

In young birds the gray of the back is tinged with yellow and the white of the under parts with buff.

Bill black ; iris brown ; legs and feet lead colour. Length about 5·5 ; wing 2·75 ; tail 2·4 ; tarsus ·7 ; bill from gape ·5.

Distribution.—The Indian race of the Gray Tit is found almost throughout the Indian Empire. In Ceylon it is common above about 2,000 feet. In the low-country forests it is rare, but seems to be resident here and there, and appears at certain seasons in other localities. It is occasionally seen in Colombo gardens, where in one or two instances it has been known to breed.

Habits.—This is a very familiar species in the hills, and may be seen, in almost every up-country garden, busily engaged hopping about tree trunks and branches. In the low-country it keeps mainly to the forests. In the hills the breeding season appears to extend from March to July. In the Puttalam District I have found it building its nest in April, while in Colombo a pair were observed breeding in February. The nest is rather a loose bunch of moss, feathers, hair, or coir fibre placed in a hole of a tree, wall, or bank. There are four to six eggs. They are oval in shape ; the ground colour is white or pinkish-white, with red spots generally more or less confined to a ring round the larger end.

Family CRATEROPODIDÆ.

Babblers, Bulbuls, &c.

The *Crateropodidæ*, as treated by Oatso, comprise a large group of ten-primaried *Passeres*, in which the plumage of the nestling resembles that of the adult female, and which bear the following characteristics : nostrils never entirely concealed by hairs or bristles ; rictal bristles present ; twelve tail feathers ; inner and hind toe equal. This group he divided into six sub-families. *Crateropodinæ*—the larger gregarious Babblers ; *Timeliinæ*—the smaller Babblers ; *Brachypteryginæ*—the Whistling Thrushes and Shortwings ; *Sibiinæ*—confined in Ceylon to two species of White-eye ; *Liotrichinæ*—the Bush and Green Bulbuls ; *Brachypodinæ*—the true Bulbuls.

Col. Harrington, in his recent monograph on the *Timeliides*,* considerably altered this classification, proposing the name of *Timeliides* for the group, which he raised to the rank of a sub-order. From this sub-order he excluded the *Brachypteryginæ* and *Brachypodinæ*, also the White-eyes and those genera of the *Liotrichinæ*, of which representatives are found in this Island.

Stuart Baker, in a still more recent classification, which I propose to follow, has not been quite so drastic in his revision. He retains the *Crateropodidæ* as a family, rejecting the *Brachypteryginæ* which he transfers bodily to the Thrushes, as far as Ceylon is concerned, with the exception of *Elaphrornis palliseri*—the Ceylon Shortwing. This last species is most probably a Warbler, but its position is still a little uncertain. The White-eyes are also raised to the rank of a family—*Zosteropidæ*, and placed next to the *Nectarinidæ*—Sunbirds.

The *Crateropodidæ* found in Ceylon, as thus reconstituted, fall into four sub-families. The characters distinguishing the whole family are those given by Oates, and narrated above with the following additions: Wing rounded, habits non-migratory. In fact, one of the main features of the family as thus defined is the absence of any migratory species. As a consequence, there is a tendency throughout the group for the forms to split up into species of restricted habitat, or into well-marked geographical races, i.e., sub-species. A large proportion of the forms found in Ceylon are specifically or sub-specifically distinct from their nearest Indian allies. Further, there is no doubt that in several of our Ceylon forms, birds from the damper low-country forests tend, as a rule, to be darker than specimens from the drier forest tracts, or from the more open patana districts up-country. In several cases these paler specimens have been, by some ornithologists, sub-specifically distinguished from the darker. In each case, however, the distinction is based solely on paler tones in the plumage generally unaccompanied by any well-marked differences in size, &c. It is a well-known fact that the hue of the plumage is largely influenced by the density of the rainfall

* *Vide* Journal Bombay Nat. Hist. Soc., Vol. XXIII.

Since, however, the rainfall zones in Ceylon are rather complicated I have hesitated to accept a sub-specific division based solely on paler shades of plumage. The geographical distribution of the resultant sub-species would be about as scattered as that of the county of Cromarty, while in all probability, if large series were collected from all parts of the Island, at least six out of every ten specimens would have to be classed as "intermediate," while only one or two would be recognized as belonging definitely to the darker or lighter races. In some cases, too, the variation appears to be as much individual as local, and any attempted subdivision would offend against the rule that no two sub-species of the same species can be resident in the same locality. Far more material, than is at present available, is required before any subdivision of such forms can be indisputably accepted.

The Ceylon members of the four sub-families may be divided thus :—

(1) *Crateropodinæ*.—Larger Babblers over 8 inches in length ; sexes alike ; gregarious ; partly arboreal and partly terrestrial, and extremely noisy ; legs and feet large ; wing short and rounded ; nostrils not completely hidden by plumes and feathers. All the Ceylon forms lay unspotted white or blue eggs.

(2) *Timeliinæ*.—Smaller Babblers under 7 inches in length ; sexes alike ; solitary or found only in small troops ; not noisy, and generally skulking in bushes, or on the ground among undergrowth ; legs and feet strong ; wings short and rounded ; nostrils exposed. All Ceylon forms lay spotted eggs.

(3) *Liotrichinæ*.—Bush Bulbuls and Green Bulbuls. Sexes dissimilar ; solitary or found in small troops ; brightly coloured ; entirely arboreal. The eggs in all Ceylon species are streakily marked.

(4) *Brachypodinæ*.—True Bulbuls. Sexes alike ; solitary or found in small troops ; habits arboreal ; tarsus very short ; wings rounded, but moderately long ; nape usually furnished with some long hairs. The eggs are spotted, almost invariably, with some shade of red.

Sub-family *Crateropodinae*.*Babblers*.

This sub-family contains the larger gregarious Babblers, which lay unspotted eggs. It is not well represented in Ceylon, though one species, the familiar "seven sisters," is one of our commonest birds. Out of ten genera and about seventy species found within Indian limits, only four species occur in this Island. Two of these are specifically, and two sub-specifically, distinct from the nearest Indian forms. All four species are of about the same size, that of an English Thrush. They pass a good deal of their time in trees, but pick up their food from the ground, hopping along in small troops, and making an incessant chatter as they turn over dead leaves, &c., in search of the insects on which they feed. Their legs are strong, their wings rounded and weak. In the genus *Crateropus*, to which two species undoubtedly belong, the bill is moderately long and only slightly curved. The position of a third species, *C. cinereifrons*, is doubtful. It differs from the other members of the genus in having a black, not a yellow, bill, while the covering membrane of the nostrils is bare instead of being half concealed with plumelets. Its eggs are not known with certainty, and may be white. Those of the other *Crateropi* are blue. In the genus *Pomatorhinus* the bill is as long as the head, slender, and with a pronounced curve. The under plumage is mainly white, and so are the eggs.

Key to Ceylon Crateropodinae.

A.—Bill fairly stout, not greatly curved, no white in plumage. Genus *Crateropus*.

(1) Bill yellowish.

(a) Plumage ashy-brown, outer web of primaries much paler than inner.

C. striatus striatus (Southern Indian Babbler).

(b) Plumage rufous-brown, outer web of primaries not much paler than inner.

C. rufescens (Ceylonese Babbler).

(2) Bill black.

C. cinereifrons (Ashy-headed Babbler).

B.—Bill long, slender, and markedly curved, lower plumage largely white.

Pomatorhinus horsfieldi melanurus (Southern Scimitar Babbler).

CRATEROPUS STRIATUS STRIATUS.

The Southern Indian Babbler.

Crateropus striatus (Oates, Vol. I., p. 112); *Malacocercus striatus* (Legge, p. 494).

Description.—Upper plumage, head, neck, and chest pale ashy-brown, the feathers with paler gray edges, those of the back also with paler shaft stripes; wing coverts more uniform brown; wing quills dark brown, the outer webs with much paler whitish-brown margins; upper tail coverts slightly more rufous; tail smoky-brown shading into darker brown towards the tip and with numerous cross-rays of darker brown; lower breast, abdomen, and under tail coverts dingy, tawny-brown. Birds from the dry districts are slightly paler on the head, neck, and breast, the edges of the feathers having almost a pearly tinge.

Bill pale horny yellow; iris white; eyelid yellowish; legs and feet dingy yellowish-white.

Length 9·5; wing 4·1; tail 4; tarsus 1·3; bill from gape 1·0.

Distribution.—The sub-species found in Ceylon is confined to this Island. It is distinguished from the South Indian form, *C. striatus griseus*, by its smaller size and smaller bill. It is found all over the low-country, being most abundant in chena, scrub jungle, and cultivated tracts. In the hills it is abundant and more locally distributed, but appears to be increasing. It is rare, however, over 5,000 feet.

Habits.—One of our most familiar birds, generally known as the “Seven Sisters” from its custom of going about in little troops of from five to seven individuals. It is seldom met with far from cultivation. The general habits are described in my remarks on the sub-family.

The eggs may be found almost all the year round, but it breeds chiefly during the north-east monsoon. The nest is a fairly compact cup made of coarse grass and plant stalks and lined with finer grass. It is usually placed in the fork of a shrub from 4 to 6 feet from the ground, but I have found it in the branches of trees as high as 20 feet up. There are usually three, rarely four eggs. The usual shape is a dumpy oval, slightly pointed at the smaller end. The texture is smooth and glossy, the colour greenish-blue. Average size $\cdot 95$ by $\cdot 72$.

CRATEROPUS RUFESCENS.

The Ceylonese Babbler.

Crateropus rufescens (Oates, Vol. I., p. 114); *Malacocercus rufescens* (Legge, p. 497).

Description.—Upper plumage, wings, and tail rufous-brown, the head slightly grayer, the outer margins of the feathers slightly paler and tinged with olive; the tail indistinctly cross-rayed; the lower plumage ferruginous-brown, the colour deepening a little on the flanks, vent, and under tail coverts. A specimen from Pundaluoya in the hills of the Central Province is distinctly grayer on the head, and more dusky elsewhere than in those from Sabaragamuwa and the Western Province.

Bill orange yellow; iris white, at times tinged with green or yellow; eyelid and orbital skin greenish-yellow; legs and feet dull chrome yellow.

Dimensions a little variable: length about 10; wing $4\cdot 1$; tail $4\cdot 5$; tarsus $1\cdot 3$; bill from gape 1.

Distribution.—Peculiar to Ceylon, and restricted to the interior of the Island in the districts with a heavy rainfall, *i.e.*, the west and south-west sides of the main hill ranges, and the country at the foot of these hills. Within these limits it is found at all elevations.

Habits.—Unlike the last species this is a jungle bird, found in thickets, bamboo scrub, and deep forest. It goes about in fairly large troops of about a dozen, and behaves in much the

same manner as the more familiar "Seven Sisters." The breeding season appears to last from March to May. The nest resembles that of the preceeding species. It is placed among creepers surrounding tree trunks, or in a low fork, and is very carefully concealed. According to Legge, the eggs are pointed ovals in shape, deep greenish-blue in colour, and measure about $\cdot 95$ by $\cdot 75$.

CRATEROPUS CINEREIFRONS.

The Ashy-headed Babbler.

Crateropus cinereifrons (Oates, Vol. I., p. 114); *Garrulax cinereifrons* (Legge, p. 499).

Description.—Forehead, crown, and sides of head ashy-gray with a bluish tinge in some lights, shading on the nape into the deep rufous-brown of the upper plumage, wings, and tail; the outer webs of the first few primaries are slightly paler, and the tail rather deeper in colour; chin whitish, shading into the tawny rufous-brown of the rest of the lower parts; flanks and under tail coverts rather darker.

Bill black; iris white; eyelids lead colour; legs and feet plumbeous-brown.

Length 10; wing 4·5; tail 4·25; tarsus 1·5; bill from gape 1·2.

This bird is not a true *Crateropus*, and its generic status is uncertain. In general its plumage resembles that of a *Garrulax*, but the feathers of the forehead are short and rounded, as in *Crateropus*. The eggs are not known with certainty, and their authentication may clear up the situation.

Distribution.—Confined to the heavy jungles in the districts west and south-west of the Adam's Peak range, which it ascends to a height of about 3,500 feet. It does not occur outside Ceylon.

Habits.—Found in small troops in the heart of the jungle. It is said to breed about April, but nothing is definitely known regarding its nidification. Legge was informed by natives that the eggs were blue, but they may possibly be white. Further information on this point is badly required.

POMATORHINUS HORSFIELDI MELANURUS.

The Ceylon Scimitar Babbler.

Pomatorhinus melanurus (Oater. Vol. I., p. 118 ; Legge, p. 501).

Description.—A band from the nostrils through the eye to the ear coverts black, bordered above by a broad white streak over the eye to the nape ; crown and nape dark olivaceous-brown ; upper plumage, the sides of the neck and body, the thighs, vent, and under tail coverts rufous-brown to olive-brown, the tint varying in individual specimens ; tail ferruginous near the base, darkening to almost black at the tip ; lower parts from chin to abdomen white. In many birds the sides of the head and chest are streaked with white ; in others the line of demarcation between the white lower plumage and the back is more abrupt.

Bill gamboge yellow, blackish adjoining the nostrils ; iris reddish-brown to dull red ; eyelid and orbital skin blue ; legs greenish lead colour, feet with a blue tinge. In young birds the bill is less curved than in adults.

Length 8·5 ; wing 3·5 ; tail 3·5 ; tarsus 1·2 ; bill from gape 1·2.

Distribution.—The Southern Scimitar Babbler is found over a large portion of Peninsular India, and is divided into four sub-species, of which the present form is found only in Ceylon. Col. Harrington is of opinion that our Ceylon form should also be divided into two races, as birds from the dry zone and the hills are, as a rule, more olivaceous than those from the low-country zone. However, as Legge points out, the variation is to a certain extent individual, and until a large series from all localities is available for examination, I hesitate to make any sub-specific distinction. This Babbler is found all over the hills and in most of the well-wooded portions of the low-country. It is rare, however, in the drier forest districts.

Habits.—A shy woodland species, which keeps close to cover, and ventures near habitations only when the thickets admit. In the hills it is especially fond of the strips of jungle bordering streams. It occurs usually in pairs, but sometimes in small troops. Its presence is most frequently made known by its deep melodious call, which Legge represents by the syllables “wok-wok-ek-ek-wok,” answered by a shorter call from the female. In the hills the breeding season appears to be from December to February. In the Puttalam District I have taken the eggs in March. The nest is rather a loose, more or less domed structure of leaves, grass, &c., placed in a bank or against the foot of a bush. Three to five white eggs are laid. The shell is thin and smooth, but not very glossy. Average size .95 by .70.

Sub-family *Timeliinæ*.

The Smaller Babblers.

The *Timeliinæ* are a large group of small Babblers, over fifty species being found within Indian limits. They are solitary or less gregarious than the larger Babblers, and are not noisy. They are skulking in their habits, frequenting bushy places, or the undergrowth in forests, keeping largely to the ground and avoiding observation. The eggs of all Ceylon species are spotted. The wings are short and rounded, the legs and feet strong. The sub-family is not well represented with us, only four species out of as many genera occurring in the Island. Of these, one is specifically and two sub-specifically distinct from any forms found in India. In the genus *Dumetia* the feathers of the forehead and crown have rigid shafts, the tail is comparatively long and graduated, and the bill fairly slender. In *Pyctorhis* the bill is deep and not notched, the nostrils are oval and exposed. In *Scotocichla* the bill is slender, the nostrils linear; the tail is graduated and almost as long as the wing; the tarsus and toes are long and stout. In *Rhopocichla* the nostrils are rounded and well exposed, the tail short, and only slightly graduated.

Key to Ceylon Timeliinæ.

A.—Forehead and crown not conspicuously darker than the rest of the upper plumage.

(1) Length about 5·6; tail about same length as wing; bill pinkish horn colour.

Dumetia albigularis albigularis (Small White-throated Babbler).

(2) Length about 6·5; tail longer than wing; bill black.

Pyciorhis sinensis nasalis (Ceylon Yellow-eyed Babbler).

B.—A conspicuous deep chocolate cap. Length about 6·5; lower parts rusty-brown.

Scotocichla fuscicapilla (Brown-capped Babbler).

C.—Forehead and cheeks black. Length about 5·5; lower parts whitish.

Rhopocichla atriceps nigrifrons (Black-fronted Babbler).

DUMETIA ALBIGULARIS ALBIGULARIS.

The Small White-throated Babbler.

Dumetia albigularis (Oates, Vol. 1., p. 134); *Dumetia albigularis* (Løkke, p. 505).

Description.—Lores and feathers round the eye whitish; upper plumage, wings, and tail olive-brown; forehead and front of crown rufous with stiff shining shafts; hind-neck slightly paler than the back; tail faintly cross-rayed; the chin, throat, and centre of breast white; remainder of lower parts rust coloured, brighter in the breeding season.

Bill pinkish horn colour; iris white or greenish; legs and feet reddish flesh-coloured.

Length 5·6; wing 2·2; tail 2·25; tarsus ·75; bill from gape ·6.

Distribution.—Occurs over the greater part of the low-country and on the patanas of the hill country up to about 5,500 or 6,000 feet. The same sub-species occurs in Southern India, and another sub-species round Mt. Abu.

Habits.—Frequents bushy patanas, the long grass, and undergrowth at the edges of paddy fields, roads, and jungle paths, also waste land and low scrub. It roams about in little troops and keeps to cover as much as possible. The breeding season extends from November to June. The nest is a ball of grass with the opening at one side. It is placed within a few inches of the ground in rough grass or a low bush. The three or four eggs are dumpy ovals of china white, thickly speckled and spotted with dull red; the markings are sometimes confluent at the larger end. Average size $\cdot 71$ by $\cdot 54$.

PYCTORHIS SINENSIS NASALIS.

The Ceylon Yellow-eyed Babbler.

Pyctorhis nasalis (Oates, Vol. I., p. 138; Legge, p. 512).

Description.—Upper plumage rufescent earth-brown, slightly darker on the head; the tertiaries and the outer webs of the other wing quills slightly more rufous; tail feathers grayish-brown, with slightly paler edges; lores, eyebrows, and the whole of the lower plumage white, tinged on the flanks and from the breast downwards with buff.

Bill and nostrils black; iris golden yellow, eyelid chrome yellow; legs and feet dull yellow.

Length about $6\cdot 5$; wing $2\cdot 6$; tail $3\cdot 25$; tarsus 1; bill from gape $\cdot 65$. The dimensions are a little variable.

Distribution.—This sub-species is found only in Ceylon, but an allied form is found almost throughout the Indian Empire and extends into Siam. It is locally but fairly widely distributed up to about 6,000 feet, but its chief haunts are the south-east of the Island, from the Uva patanas to the sea.

Habits.—May be looked for in fern lands, stretches of mana grass, low jungle, lantana scrub, and thick undergrowth. It keeps to cover during the day, but in the evenings is fond of perching at the top of a bush, giving out its call, which Legge describes as a plaintive whistle of two notes varied with a peculiar mewing call. The breeding season extends from February to May. The nest is a deep cup of grass and cobwebs, lined inside with fine grass and roots, and placed in the fork of a shrub or in a tuft of mana grass. The three or four eggs are of fleshy-white, spotted, mainly at the larger end, with brownish-sienna, occasionally overlaid with brick red. Average size $\cdot 78$ by $\cdot 58$.

SCOTOCICHLA FUSCICAPILLA.

The Brown-capped Babbler.

Pellorneum fuscicapillum (Oates, Vol. I., p. 143; Legge, p. 510).

Description.—Forehead, crown, and nape deep chocolate, with brighter shafts; rest of upper parts, wings, and tail dark olive-brown, the feathers of the upper back and wing coverts with paler shafts, the edges of the primary quills lighter rufous; the lores, sides of head and neck, and all the lower parts rusty rufous, the colour being deeper on the cheeks and ear coverts and paler on the chin and abdomen; in some specimens the sides of the neck and breast are faintly streaked.

Bill, upper mandible deep brown with pale margins, lower mandible flesh-coloured; iris light to dark red; legs and feet brownish flesh colour.

Length 6·5; wing 2·6; tail 2·5; tarsus 1·1; bill from gape $\cdot 8$.

Distribution.—Peculiar to Ceylon. Fairly common in jungle undergrowth all over the wooded portions of the low-country and up to about 5,500 feet. Birds from the drier districts are paler than those from the wet zone. A pale specimen from Trincomalee has lately been distinguished as *S. f. dubaulti*, but until more material is available, I am not in favour of any sub-specific distinction.

Habits.—A shy skulking bird, keeping almost entirely to thick scrub, low jungle, or the undergrowth in forests. It is more often heard than seen. The note is a whistle, which may be described by the words "to meet you." It may frequently be heard, in the jungle, as also may the breeding song of the cock, which reminds one of a small boy whistling up and down the scale. The birds generally go about in pairs, or small family groups, picking up beetles, &c., from the ground.

The breeding season appears to be from November to March and again about September. The description of the nest given by Legge, as a cup-shaped structure placed in a bush, is probably due to an error. Authentic nests have recently been found by myself and Mr. Tunnard of Rothschild, Pussellawa. My nest, from the North-Central Province, was domed, and very cleverly camouflaged in a litter of dry leaves on the ground in the forest. The opening was at one side, and the materials were very roughly put together. The lining consisted of a few broken up dead leaves, and the roof of a few more broad dry leaves. Mr. Tunnard's nest was equally cleverly hidden, but more carefully lined with weed stalks and the stems of maiden-hair fern. The two or three eggs are broad ovals with rather a blunt narrow end. The ground colour is china white, thickly covered with grayish-purple and reddish-brown markings. Average size .85 by .64.

RHOPOCICHLA ATRICEPS NIGRIFRONS.

The Black-fronted Babbler.

Rhopocichla nigrifrons (Oates, Vol. I., p. 160); *Alcippe nigrifrons* (Legge, p. 507).

Description.—Forehead, round the eye, and ear coverts dull black, the forehead feathers with glistening shafts; sides of neck, upper plumage, wings, and tail rufous-brown, darkening on the crown into the black of the forehead; outer wing quills with paler edges; tail darker at the tip, and in some specimens faintly cross-rayed; throat, neck, breast, and abdomen white, the feathers, except on the chin, throat,

and lower cheeks, with black bases which give the plumage a sullied appearance; flank, vent, and under tail coverts rufous-olive.

Birds vary a good deal in the tint of the upper plumage, specimens from the low wet zone being, as a rule, decidedly more rufous, those from the hills more olive-brown, while birds from the northern forests are intermediate.

Bill dark brown on the tip, the margins of the upper mandible and the lower mandible flesh colour; iris whitish or pale yellow; legs and feet fleshy lavender.

Length 5·1; wing 2·2; tail 1·8; tarsus ·85; bill from gape ·7.

Distribution.—The present sub-species is confined to Ceylon, but is widely distributed over the whole Island. Allied sub-species occur on the Nilgiris and in Travancore.

Habits.—Common everywhere in thickets and forest undergrowth, especially bamboo scrub. It is an active little bird, which flits about in small parties uttering a shrill little rattling note. It appears to breed intermittently from December to June. The nest, which is frequently met with in the jungle, looks almost like a chance wisp of dry grass or bunch of dead leaves stuck in the fork of a sapling or bush about 4 to 7 feet from the ground. The inside is pocket-shaped and tilted, so that the opening lies, in some cases, almost horizontally. The two or occasionally three eggs are smooth paper-white ovals scattered over with spots of brownish-red and a few specks of bluish-gray. Average size ·75 by ·55.

Sub-family *Liotrichinæ*.

Bush and Green Bulbuls.

With this sub-family, which includes three species found in Ceylon, we come to a group of birds distinguished from the rest of the *Crateropodidæ* by the difference in plumage between the two sexes. Unlike the Babblers, they are strictly arboreal in their habits, frequenting leafy trees and living on fruit and insects. In all three Ceylon species the bill is slender,

slightly curved, and notched at the tip; the rectal bristles are minute, the nostrils oval, the wing rounded, the tail short and square. In the genus *Ægithina* there are two moults in the year, and the males have a distinct breeding plumage; the bill is about two-thirds the length of the head, and the plumage of the rump is very soft and fluffy. In *Chloropsis* there is no distinct breeding plumage, and only one moult a year. The bill is longer and slightly more curved, the wings are rather longer, and the tarsus very short. The eggs of all our Ceylon species are streakily marked.

Key to Ceylon Liotrichinae.

A.—Bill about same length as tarsus; lower plumage yellow; wings mainly black and white.

Ægithina tiphia zeylonica (Common Iora).

B.—Bill considerably longer than tarsus; plumage mainly grass-green; a blue moustache stripe.

(1) Forehead orange.

Chloropsis malabarica malabarica (Malabar Chloropsis).

(2) Forehead greenish.

C. jerdoni (Jerdon's Chloropsis).

ÆGITHINA TIPHIA ZEYLANICA.

The Common Iora.

Ægithina tiphia (Oates, Vol. I., p. 230); *Iora typhia* (Legge, p. 490).

Description.—Male in summer plumage: Forehead, crown lores, nape, and mantle satin black; the remainder of the back and the rump black, more or less mixed with dark green; a tuft of concealed downy white plumes on the scapulars; upper tail coverts and tail black; wing coverts black with a broad white patch formed by the terminal half of the median coverts, the greater coverts more or less tipped with white; wing quills black, the primaries brownish at the tip, and some of the quills with faint pale edges; face, sides of neck, and all the lower parts rich yellow, which grows paler on the vent and under tail coverts. In the off season the upper plumage

becomes largely green, the black persisting most on the head and nape ; the wings and tail remain black, but the white tips on the coverts are more pronounced ; the lower parts are less rich in hue.

Female : Upper plumage dull grass-green ; forehead and upper tail coverts tinged with yellow ; scapulars darker, and tail dusky-green ; lesser wing coverts dusky-green, median coverts blackish with broad white tips faintly edged with yellow ; in the greater coverts the white is confined to the outer webs and more conspicuously tinged with yellow ; primaries blackish with faint white edges on the outer webs and broader white inner margins on the basal portions ; inner quills with broad white margins which are tinged with yellow, especially on the outer webs ; lores, sides of head, and all the lower parts yellow, shading into green on the flanks.

Bill. upper mandible black with blue margins, lower mandible blue ; iris, in males gray, mottled with brown, in females olive-gray ; legs and feet slate blue.

Length 5·4 ; wing 2·5 ; tail 1·9 : tarsus ·75 : bill from gape ·7.

Distribution.—The present sub-species occurs in Ceylon, Southern India, and the Malay Peninsula : typical *E. tiphia* occurs over the rest of India, except in the north-west. This Bulbul is common, and widely distributed over the whole of the low-country and up to about 2,500 feet.

Habits.—A familiar little bird which keeps to leafy trees, either in gardens and open scattered groves, or on the edge of the jungle, by roadsides, &c. It is generally seen in pairs, actively flitting about among the leaves searching for insects. The male has a clear gentle whistle of two notes “ wheee-too.” The breeding season lasts intermittently from November to June. The nest is a beautiful little cup of fine grass and fibres, thickly coated with cobwebs and glued on to the top of a bough, or attached to a fork from 6 to 20 feet from the ground. I have never found more than two eggs. They are slightly pointed ovals of grayish-white, with rather large longitudinal streaks of bluish-gray and light brown. Average size ·70 by ·53.

CHLOROPSIS MALABARICA MALABARICA.

The Malabar Chloropsis.

Chloropsis malabarica (Oates, Vol. I., p. 235); *Phyllornis malabaricus* (Legge, p. 488).

Description.—Male : Forehead orange-yellow ; lores, cheeks, chin, and throat black ; a moustache streak of hyacinth blue ; lesser wing coverts turquoise blue ; remainder of plumage grass-green, the inner webs of the wing quills dull brown.

In the female the throat patch and cheek stripe are smaller. Young birds are green all over.

Bill blackish ; iris brown ; legs and feet slaty-blue.

Length 7·5 ; wing 3·5 ; tail 2·6 ; tarsus ·7 ; bill from gape ·95. Females are slightly smaller.

Distribution.—Not so common as Jerdon's Bulbul, but widely, though locally, distributed both in the hills and the low-country. It is indistinguishable in the open from the next species, unless one is near enough to make out the orange-yellow forehead. The present sub-species is found in India on the Malabar Coast and as far north as Khandala ; another sub-species is found in Assam, Eastern Bengal, Burma, and Cambodia.

Habits.—Much the same as those of the next species, but it is apparently not such a good mimic. Little is known of its breeding habits.

CHLOROPSIS JERDONI.

Jerdon's Chloropsis.

Chloropsis jerdoni (Oates, Vol. I., p. 238); *Phyllornis jerdoni* (Legge, p. 485).

Description.—Lores, cheeks, chin, and throat black ; a hyacinth blue moustache stripe ; forehead, above the eye, and all round the black gorget greenish-yellow ; lesser wing coverts turquoise blue ; rest of plumage grass-green, the lower parts slightly brighter.

In females the lores and gorget are bluish-green and the cheek stripe greenish-blue. The young are green all over.

Bill blackish ; iris brown ; legs and feet pale bluish.

Length 7·4 ; wing 3·4 ; tail 2·8 ; tarsus ·75 ; bill from gape ·95.

Distribution.—Found all over the low-country in well-wooded parts. It ascends the hills to 3,500 feet or occasionally higher. It occurs over the greater portion of the peninsula of India.

Habits.—A common bird, which often escapes notice as the plumage so closely resembles the green of the foliage. It frequents trees in compounds and gardens, by the roadside and river banks, or round tanks and paddy fields. It is generally found singly or in pairs, but when not breeding, the females collect in little troops. It is an active little bird, assiduously hunting among the leaves of trees or fronds of palms for the insects on which it feeds. The male has a clear pleasant whistle, and mimics the calls of other birds with astonishing accuracy.

It appears to have several broods, beginning in November or December, as soon as the rains have set in, while I have found the eggs as late as May. The nest is hard to find. It is a soft neatly woven cup, composed of fine strips of grass or tow-like fibre, suspended by the rim to the fork of a slender twig, and always well concealed by overhanging leaves. It is generally 6 to 10 feet from the ground, but occasionally much higher. The two eggs are slightly pointed, glossless cream-coloured ovals, sparingly marked with short fine streaks or spots of dark brown, at times almost black. Average size ·82 by ·59.

Sub-family *Brachypodinae*.

Bulbuls.

The Bulbuls are a familiar group of small birds, with fairly well-defined characteristics. They are mainly arboreal in their habits. The sexes are alike, the young closely resemble the adults, and all species lay eggs, which are marked with various shades of red and purple. The most characteristic feature of this sub-family is the extreme shortness of the tarsus, but they are further distinguished by the presence of hairs among the feathers of the nape.

In most of our Ceylon species, however, these hairs are short and sometimes difficult to detect. The rectal bristles are fairly well developed ; the nostrils lie in a groove at the base of the bill ; the wings are rounded and moderate in length ; the tail is also moderate and generally rounded. The Bulbuls are found mainly in Africa and Southern Asia. Six species belonging to five genera occur in Ceylon. One genus, *Kelaartia*, is peculiar to the Island, as is also one species of another genus. The main generic characters are given in the following key :—

Key to Ceylon Brachypodinae.

I.—A distinct bushy, black crest.

A.—Length about 9·75 ; wing rather pointed ; outer tail feathers curved outwards ; bill coral red.

Hypsipetes psaroides ganeesa (Southern Indian Black Bulbul).

B.—Length about 7·75 ; wing blunt ; bill black ; under tail coverts crimson.

Molpastes hæmorrhous hæmorrhous (Madras Red-vented Bulbul).

II.—No distinct crest.

A.—Bill about three-quarter length of head ; upper mandible sharply keeled. Genus *Iole*.

(1) Crown and upper plumage yellowish-green.
Iole icterica (Yellow-browed Bulbul).

B.—Bill about half length of head ; upper mandible not so sharply ridged. Genus *Pycnonotus*.

(1) Crown and nape black ; upper plumage olive-green.

P. melanicterus (Black-capped Bulbul).

(2) Crown and upper plumage ashy-brown.

P. luteolus (White-browed Bulbul).

III.—Crown feathers large and rounded ; a bright yellow streak of longish pointed feathers over ear coverts.

Kelaartia pencillata (Yellow-eared Bulbul)

HYPSSIPETES PSAROIDES GANEESA.

Southern Indian Black Bulbul.

Hypsipetes ganeesa (Oates, Vol. I., p. 262 ; Legge, p. 469).

Description.—Lores, forehead, crown, and nape glossy-black, with a greenish lustre in freshly moulted specimens, the feathers longish ; hind-neck, back, rump, and upper tail coverts dull bluish-gray with darker shaft streaks ; wings and tail dull brown, the wing coverts and inner wing quills edged with the blue-gray of the back ; cheeks, throat, chest, and under parts slaty-gray, paler on the abdomen, and darker on the cheeks and chin, which are tinged with ashy-brown.

Bill coral red ; iris orange or reddish ; legs and feet yellowish-red.

Length 9·75 ; wing 4·7 ; tail 4·7 ; tarsus ·8 ; bill from gape 1·2.

Distribution.—Common in the well-wooded parts of the low-country damp zone and on the hills, but rarely met with in the drier forest tracts. It appears to visit the highest elevations in the dry weather.

The sub-species found in Ceylon is also met with on the Malabar hills. Allied sub-species occur on the Himalayas, in Assam, and parts of Burma.

Habits.—Out of the breeding season this Bulbul is generally found in noisy flocks, feeding on fruits and berries at the top of tall trees in forest and jungle. Its most frequent calls are described by Legge as resembling the sounds “ tchee ” and “ zu, kink up.”

The breeding season is from January to about April. The nest is a rather untidy cup of dead leaves, roots, and moss placed in a fork of a branch generally at some height from the ground. There are usually only two eggs of a whitish ground colour thickly speckled with red and purplish-gray. Average size 1·03 by ·72.

MOLPASTES HÆMORRHOUS HÆMORRHOUS.

The Madras Red-vented Bulbul.

Molpastes hæmorrhous (Oates, Vol. I., p. 268); *Pycnonotus hæmorrhous* (Legge, p. 482).

Description.—Head, chin, and throat deep black, inclining to brown on the ear coverts; there are generally one or two longish hairs on the nape; feathers of neck, back, wing coverts, scapulars, and breast brown with pale edges; rump plain brown; upper tail coverts white; wing quills brown with narrow paler edges; tail brown at the base, deepening to black at the end and tipped with white; flanks light brown; abdomen whitish; under tail coverts crimson. In some specimens the tail coverts and tip of the tail are pale cinnamon. Birds from the hills are paler than low-country specimens.

Bill black; iris deep brown; legs and feet dark brown.

Length 7·8; wing 3·75; tail 3·2; tarsus ·85; bill from gape ·8.

Distribution.—Extremely common over the whole of the low-country and at medium elevations. It is only occasionally met with in the higher hills. This species is found in one form or another over most of India and Burma and extends to China.

Habits.—Familiar in gardens and near civilization over the whole of its usual range. It frequents bushes, low trees, hedges, &c. It is not nearly so common far from cultivation. The cry is a cheerful little chirruping warble. It breeds fairly steadily from November till May, or even later if the weather be favourable, rearing several broods. The nest is a small, rather coarsely woven cup of grass, lined almost invariably with fine red root fibres. On occasions the nest is made of fine small-leaved tender shoots. It is generally placed in a bush or hedge, but the birds occasionally build in verandahs, &c. There are usually three eggs; they are in most cases rather dumpy and slightly pointed at the small end. The ground colour varies from china-white to pinkish, thickly spread with blotchy specks of reddish-brown and purplish-gray. Average size ·85 by ·63.

IOLE ICTERICA.

The Yellow-browed Bulbul.

Iole icterica (Oates, Vol. I., p. 283); *Criniger ictericus* (Legge, p. 472).

Description.—Upper surface yellowish-green; inner webs of wing quills brown, the basal portions edged with yellow; tail feathers brighter towards the outer edges, the inner edges of all but the central feathers and the under surface of the shafts yellow; lores, base of nostrils, a narrow eyebrow, face, entire under surface, and wing lining bright yellow.

Bill black; iris red or light red; legs and feet bluish-lead or dusky-slate colour.

Length about 8; wing 3·5; tail 3·2; tarsus ·72; bill from gape ·82. Females are slightly smaller.

Distribution.—Restricted to forest and high jungle throughout the low-country and up to about 4,000 feet or even higher. In India it is found on the west coast as far north as Mahableshwar.

Habits.—Essentially a jungle bird. In the low-country it keeps to the large forests; at medium elevations it occurs in nearly every patch of jungle. It generally wanders about in little parties, which hunt actively among the boughs and in the top of the undergrowth for the insects on which they chiefly feed. The call is a soft mellow whistle. The breeding season is probably during the first half of the year, but eggs may be found as late as August. The nest is generally suspended by the rim to a fork in the top of a thin sapling. It is composed of small twigs and grass and is lined with fine grass. The two eggs are longish ovals; the ground colour is dull white or pinkish, thickly speckled with pale brownish-red or pink markings. Average size (of Indian eggs) ·96 by ·67.

PYCNONOTUS MELANICTERUS.

The Black-capped Bulbul.

Pycnonotus melanicterus. (Oates, Vol. I., 288); *Rubigula melanictera* (Legge, p. 477).

Description.—Forehead, crown, nape, and sides of head black; upper plumage and wing coverts olive-green; wing quills brown, the outer webs olive-green; tail feathers dark

brown, the basal portions washed with the hue of the back ; there is a broad white patch on the tips of the outer feathers ; this patch decreases on the inner feathers, the central pair being unmarked ; lower plumage bright yellow, the sides of the breast and body washed with olive ; wing lining and edge of wing yellow.

Bill black ; iris dull red in males, dark brown in females ; legs and feet blackish in males, blackish-blue or deep lead colour in females.

Length 6·5 ; wing 2·8 ; tail 2·6 ; tarsus ·6 ; bill from gape ·78. Females are slightly smaller.

Distribution.—Peculiar to Ceylon. It occurs throughout the whole of the low-country, except in the most arid parts, and on the hills up to about 5,000 feet.

Habits.—Fairly common in forest, low jungle, clumps of thicket, shady ravines, &c. It may be met with either in pairs or small troops, and often consorts with the forest Bulbul or White-browed Bulbul. The note is a little “ whee whee, whee, whee.” The breeding season is probably from March to July, occasionally later. The nest, of the usual Bulbul type, is placed in the fork of a low tree or bush, or even on a dead stump. Two or three eggs are laid. The ground colour is reddish-white, thickly marked with reddish-brown and a little bluish-gray. Average size ·79 by ·58.

PYCNONOTUS LUTEOLUS.

The White-browed Bulbul.

Pycnonotus luteolus (Oates, Vol. I., p. 290 ; Legge, p. 475).

Description.—Upper plumage ashy-brown, the edges of the feathers, except on the crown, washed faintly with green ; rump and upper tail coverts slightly paler ; wings and tail brown, washed with greenish on the outer webs ; a broad streak from the nostril over the eye and an indistinct ring round the eye whitish ; lores streaky white and black ; ear coverts brownish ; the point of the chin and a stripe along the lower jaw yellowish ; under parts dingy-white, washed with

brown on the chest and flecked with pale dingy-yellow ; vent and under tail coverts, wing-lining, and edge of wing pale yellow.

Bill black ; iris rusty-red to blood-red ; legs and feet dusky lead-colour.

Length 7.4 ; wing 3.2 ; tail 3.1 ; tarsus .87 ; bill from gape .85.

Distribution.—Very common all over the low-country and in the hills to 3,000 feet or even higher. In India it is found over a great part of the peninsula proper.

Habits.—Very much the same as those of the Madras Bulbul but it is not nearly so partial to cultivation, being especially common in bushy scrub, lantana, chenas, low jungle, and the undergrowth in dry forests.

It feeds partly on insects, but is very fond of small berries, such as those of the lantana. It is rather a shy bird, evading observation as much as possible.

It breeds freely from February to June. The nest is scarcely distinguishable from that of the Madras Bulbul, and like it, is generally placed in a low bush. There are, however, seldom more than two eggs. Typically they are longer and narrower than those of the Madras Bulbul, but light specimens are often very hard to distinguish. In more heavily marked eggs the markings are less claret-coloured and more of a light reddish-brown, while the tint of the ground colour, though pale, differs correspondingly. Average size .91 by .62.

KELAARTIA PENCILLATA.

The Yellow-eared Bulbul.

Kelaartia pencillata (Oates, Vol. I., p. 297 ; Legge, p. 480).

Description.—A narrow white line from the nostril to the upper part of the eye ; forehead and crown dull black, the feathers broad and loose, giving a scaly effect ; a broad yellow streak from the top of the eye to the nape ; a spot on the upper eyelid and the chin white ; lores and cheeks black ; ear coverts black with a yellow spot, behind which the colour changes into a gray patch ; upper plumage olive-green ; wings and tail dark brown washed with olive-green on the

outer webs ; lower plumage from throat to tail coverts yellow, washed with olive on the breast and flanks ; wing-lining and edge of wing yellow.

Bill black ; iris red mingled with brown or deepening to brown next the pupil ; legs and feet dark lead-blue.

Length 7·75 ; wing 3·25 ; tail 3·2 ; tarsus ·78 ; bill from gape ·85. Females are rather smaller.

Distribution.—Confined to Ceylon and restricted to the hills, being seldom found much below 3,500 feet.

Habits.—Abundant in the higher ranges where it frequents forests, patana, woods, and the outskirts of cultivation. It keeps generally to the lower trees and undergrowth, and appears to live mainly on fruit. The call is a small plaintive whistle “ whee, whee, whee,” quickly repeated. The breeding season appears to be about April. The nest is a fairly neat cup of moss, grass, and fine roots and leaves. There appear to be only two eggs of a pale pinkish ground colour, with rather blurred blotches and streaks of pinkish-brown. I have no measurements, but probably the eggs are of the same size as that of the forest Bulbul.

Family SITTIDÆ.

Genus **Sitta**.

Nuthatches.

The Nuthatches are a family of small climbing birds found in temperate and warm climates all over the world, with the exception of South America and Africa, south of the Sahara. The foot is adapted for climbing, the hind toe and claw being greatly developed and the inner front toe shortened. The hind surface of the tarsus is smooth. The bill is about as long as the head, straight, and wide at the base. The nostrils are clear of the line of the forehead, and are overhung by hairs. The rectal bristles are well developed. The wing, which has ten primaries, is rather pointed ; the first primary is less than half the length of the second. The tail of twelve feathers is short and practically square.

The plumage of the two sexes is generally different, and there is only one moult a year.

Nuthatches are of non-migratory habits. They feed both on nuts and insects, and nest in holes of trees or of rocks. Only one species is found in Ceylon.

SITTA FRONTALIS FRONTALIS.

The Velvet-fronted Blue Nuthatch.

Sitta frontalis (Oates, Vol. I., p. 307); *Dendrophila frontalis* (Legge, p. 560).

Description.—Male: Lores, a broad band across the forehead and a long streak over the eye to the nape deep velvet black; upper plumage and wing coverts deep lavender-blue; wing quills dull black, the first two primaries unmarked, the outer webs of the remaining primaries edged with light blue, the secondaries edged with the blue of the back, the tertiaries almost entirely blue; the middle feathers of the tail blue, the remainder dull black, edged and tipped with blue; ear coverts lilac; chin and throat whitish; the rest of the lower parts brownish-lilac.

Females have no black eyebrow streak, and the lores are generally washed with blue.

Bill coral red, the tip of the upper mandible blackish; iris yellow; eyelids lead colour; legs and feet brownish.

Length 5; wing 3; tail 1·8; tarsus ·7; bill from gape ·7.

Distribution.—Found throughout the hills and in the tall forests of the low-country. It occurs in one form or another throughout the greater part of India, and extends through Burma to Java.

Habits.—A dainty little bird, which attracts notice by its velvety blue plumage and vivid red bill. It is generally found in small troops, actively running up and down or round and round tree trunks and large boughs. It never remains long on one tree, and when descending it always proceeds head first. The cry is a sharp little "chick, chick, chick." The breeding season appears to be from February to May. The nest is a small pad of feathers, moss, and hair in a tiny hole in a tree. The four eggs are white spotted with red, and measure about ·7 by ·56. The birds when approaching the nest hole generally alight above it and run down into it.

Family DICRURIDÆ.

Drongos.

The Drongos, or King Crows, with their black plumage and forked tails, form one of the best defined families of the order. The nostrils are clear of the line of the forehead. The beak is stout and covered at the base by thick-set hairs, or plumelets, which partially conceal the nostrils; the upper mandible is keeled, the tip is more or less hooked and provided with a single notch. The rictal bristles are well developed. There are ten primary quills. The tail of ten feathers is deeply forked. Members of the family are found in Africa and South-eastern Asia. Of the six species which occur in Ceylon, four are referable to the genus *Dicrurus*, which has no crest and a normally forked tail. Two larger crested species are placed each in a separate genus. In *Dissemurulus* the tail feathers are proportionately longer than in *Dicrurus*, but the inner webs, though curling upwards at the end, are normally webbed. In *Dissemurus* the outermost tail feathers, in adults, are greatly elongated and racket-shaped, the central portion of the shaft being practically webless. In some localities our local species appear to undergo a certain amount of seasonal movement.

Key to Ceylon Dicruridae

I.—Length under 12 inches; no distinct crest. Genus *Dicrurus*.

(a) Lower tail coverts not white throughout.

(1) Lower plumage black.

Dicrurus ater minor (Black Drongo).

(2) Lower plumage dark gray.

D. leucophæus longicaudatus (Indian Ashy Drongo).

(b) Lower tail coverts unmixed white.

(1) Throat and breast gray.

D. cærulescens (White-bellied Drongo).

(2) Throat and breast dark brown.

D. leucopygialis (White-vented Drongo).

II.—Length over 12 inches ; forehead tufted.

- (a) Hind feathers of the tuft erect ; inner web of outermost tail feathers normal.

Dissemurulus lophorhinus (Ceylon Black Drongo).

- (b) Hind feathers of tuft curving backwards ; terminal portion of outer tail feathers with a distinct racket in adults ; with an indentation on inner webs in young birds.

Dissemurus paradiseus ceylonensis (Larger Racket-tailed Drongo).

DICRURUS ATER MINOR

The Black Drongo.

Dicrurus ater (Oates, Vol. I., p. 312) : *Buchanqa atra* (Legge p. 386).

Description.—Plumage black glossed with steel blue, in fresh specimens the gloss on the tail is slightly greenish ; primary quills rather rusty black. There is a small white spot at the lower corner of the gape, not always easily perceptible.

In young birds the wing quills and lower plumage are brownish ; the feathers of the abdomen are fringed, and the lower tail coverts barred with white, which gradually disappears as the birds grow older.

Bill, legs, and feet black ; iris brownish-red or red.

Distribution.—The Black Drongo is found all over India, and extends into China, Siam, and Java. The Ceylon race is a distinct sub-species, which may also possibly occur in the extreme south of India. It differs from other Indian forms by its smaller size and comparatively smaller tail. In Ceylon it is confined to the Jaffna peninsula and the coastal region of the Mannar District.

Habits.—Not uncommon in the localities in which it occurs. It frequents open and cultivated lands and scattered thorny jungle, perching on posts and exposed branches and swooping out on passing insects, then returning to its post of vantage. It often also perches on the backs of cattle. The note is a

rather melodious metallic whistle. The breeding season is probably mainly in April and May. The nest is a very shallow cup placed in the fork of a leafy branch. The outside is fairly thickly bound with cobwebs, the interior lined with fine grass. Three appears to be the normal number of eggs in Ceylon. They are of two types: one pure white, the other pale salmon colour with rather bold reddish-brown blotches. Average size about 1.00 by .75.

DICRURUS LEUCOPHÆUS LONGICAUDATUS.

The Indian Ashy Drongo.

Dicrurus longicaudatus (Oates, Vol. I., p. 314); *Buchanga longicaudata* (Legge, p. 390).

Description.—Upper plumage metallic bluish-black with a gray tinge, which increases on the tail coverts; wing quills and tail lusted with greenish on the outer webs; lower parts dull grayish-black.

In young birds the plumage is dark brown: the lower parts are grayer than in adults, and the under tail coverts are tipped with white, which gradually disappears.

Bill, legs, and feet black; iris red.

Length 10.5; wing 5.2; tail 5.9; tarsus .7; bill from gape 1.1.

Distribution.—Like the Black Drongo this species has a wide range over practically the whole of the Indian Empire, the Malay Peninsula, and Java, and is split up into geographical races. The small sub-species found in Ceylon appears to be a migrant, probably from Southern India. It occurs during the north-east monsoon on the east side of the Island. One or two specimens have been shot near Colombo in October, probably while on passage.

Habits.—Generally found on the edge of open spaces in heavy jungle and forest. It perches on some point of vantage high up in a tree, swooping out on insects and returning to its perch. Its calls are rather shrill and varied. It is not likely to be found breeding in the Island. The nest is of the usual Drongo type, and the eggs resemble the spotted eggs of *D. ater minor*, but are slightly smaller.

DICRURUS CÆRULESCENS.

The White-bellied Drongo.

Dicrurus cærulescens (Oates, Vol. I., p. 316; *vide* Legge, p. 394).

Description.—Upper surface black, strongly glossed with blue; throat and breast gray; abdomen, flanks, vent, and under tail coverts white.

Bill, legs, and feet black; iris red.

Length about 9·5; wing 4·75; tail about 4·5; tarsus ·75; bill from gape 1·05.

Distribution.—Found over practically the whole of India proper. Birds from South India appear to be darker and smaller than those from the North.

Birds from the extreme north of Ceylon, perhaps migrants from South India, are apparently nearer to typical *D. cærulescens* than to *D. leucopygialis*, which is the form usually met with in Ceylon.

Habits.—Those of the next species. The nest and eggs, too, would be almost indistinguishable.

DICRURUS LEUCOPYGIALIS.

The White-vented Drongo.

Dicrurus leucopygialis (Oates, Vol. I., p. 316); *Buchanga leucopygialis* (Legge, p. 392).

Description.—Specimens vary considerably. In true *D. leucopygialis* from the south of the Island the upper plumage is black, glossed with steel blue; wings and tail brownish with a greenish-blue gloss; chin, fore-neck, and breast rusty-black; the lower abdomen often mixed with white; vent and under tail coverts white. Birds from up-country and the northern forest tract are paler; the throat and breast are a more grayish-brown, and the white of the vent extends further up the abdomen.

Bill, legs, and feet black; iris red.

Length about 9·5; wing 4·75; tail variable, about 4·50; tarsus ·75; bill from gape 1·05.

Distribution.—I am of opinion that this form is merely a sub-species of *D. caerulea*. It is peculiar to Ceylon, and is common all over the Island up to about 4,500 feet, except in heavy forest or in the Jaffna peninsula and that part of the Mannar District where the Black Drongo occurs.

Habits.—A familiar bird in the cultivated parts of the country; it may even be seen in Colombo gardens. It occurs also in open woods, the outskirts of chenais in the jungle, round tanks, &c. It is entirely insectivorous, and, like other Drongos, is fond of taking up a particular perch, from which it makes sallies. The ordinary note is a whistling cry. It is very pugnacious, and bullies birds far larger than itself if they come near. The breeding season is from March to May. The nest is a shallow cup, tightly wedged into the fork of a slender branch. It is lined with fine grass, and thickly coated outside with cobwebs. Three or sometimes only two eggs are laid. In general they are rather stumpy ovals slightly pointed at one end; some are more elongated. The colour is either pure white with bold brick-red markings, or pale salmon-pink more or less boldly blotched, chiefly at the large end, with red, and with a few fainter underlying marks of grayish-purple. Average size .92 by .69.

DISSEMURULUS LOPHORHINUS.

The Ceylon Black Drongo.

Dissemurulus lophorhinus (Oates, Vol. I., p. 322); *Dissemurus lophorhinus* (Legge, p. 396).

Description.—Plumage black, highly glossed with blue on the head, hind-neck, throat, and chest; on the back, wing coverts, and tail the gloss is greener; flanks and abdomen rusty-black without any gloss. In immature birds the lower tail coverts and wing-lining are tipped with white.

Bill, legs, and feet black; iris dull brownish or dark yellowish-red.

Length, variable, up to about 14; wing 5.8; tail, in adults, up to 8; tarsus 1.05; bill 1.4.

The crest on the forehead is about $\frac{1}{2}$ inch long, the foremost feathers are directed forwards, the hinder feathers erect, but not curved backwards.

Distribution.—Until lately this species was supposed to be peculiar to Ceylon, but recently it has been discovered in South Travancore, where it is not uncommon. In Ceylon it is restricted to the forests of the wet zone, from the Deduru-oya on the north to the Walawe river in the south-west. It is rarely found east of the Peak range, which it ascends to a height of about 4,500 feet.

Habits.—A forest bird, which is generally met with in pairs among the top branches of tall trees in the heart of the jungle. It is very noisy and has considerable vocal powers, being able to mimic the calls of many species of birds. I have also heard it imitate a cat in the most realistic manner. Like the other Drogos, it is entirely insectivorous, and takes its prey on the wing with a short swoop from a fixed perch to which it returns. The breeding season is about April. Little is known of its nidification, however.

DISSEMURUS PARADISEUS CEYLONENSIS.

The Larger Racket-tailed Drogo.

Dissemurus paradiseus (Oates, Vol. I., p. 325 ; Legge, p. 399).

Description.—Plumage black with a strong metallic gloss of steel blue, except on the chin, lower abdomen, vent, and the greater part of the wing quills, which are dull black. In immature birds the wing-lining and under tail coverts are tipped with white, and the racket feathers are not fully developed ; but there is always, except in very young specimens, an indentation in the inner web of the long outermost feathers.

Bill, legs, and feet black ; iris brownish-red to deep red.

Length : Males 17 to 19 inches according to length of tail ; wing 6 ; tail 11 to 13 ; tarsus .95 ; bill from gape 1.25. Females are rather smaller : wing 5.8 ; tail 10 to 11.

The crest on the forehead is up to 1 inch in length ; the foremost feathers are almost erect ; the hind feathers curve backwards.

Distribution.—This Drongo is widely distributed over the greater part of India. It ranges eastwards into Hainan, and south-east through the Malay Peninsula to Java and Borneo. It is divided into a number of sub-species, the Ceylon form being distinguished by its small size, its comparatively short crest and shorter tail. It replaces the Ceylon Black Drongo in the drier forest tracts, especially in the north and east of the Island, but it is nowhere very abundant. It does not appear to ascend the hills above about 2,000 feet.

Habits.—Like the preceding species, this is a forest bird, and has much the same habits. Its notes are varied, and it is an expert imitator of many other birds. In addition, it has a beautiful clear tinkling call, which is generally heard in the early morning. Like most Drongos, it appears to have an inveterate hatred of Owls and Woodpeckers. It is generally met with in pairs or in small parties of four or five. The breeding season is from March to May. Three nests, of which I have data, were all found in roadside trees, where the road passed through heavy jungle. They were placed in slender forks at a considerable height from the ground, and resembled larger editions of the nest of *D. leucopygialis*, but were more loosely woven and not so tightly jammed into the fork. There are usually three eggs. They are broad ovals slightly pointed at one end. The ground colour is pinkish-white with a moderate amount of reddish-pink markings overlying more cloudy marks of grayish-purple. All the markings are inclined to be streaky, and are most numerous round the cap. Average size 1·06 by ·81.

Family SYLVIIDÆ.

Warblers.

The Warbler family contains a very large number of species, found chiefly in the temperate and warm regions of the Old World. They are all of small size, and nearly all of plain appearance. The plumage of the nestling resembles that of the adult female, but is brighter. The nostrils are clear of the line of the forehead, the edges of both mandibles are smooth, or at times the upper mandible has a simple notch. The

tarsus is generally slim and fairly long, its hinder aspect is smooth. The toes also are slim and longish and well adapted for clinging round grass stems or thin sprays of foliage. The wing has ten primaries, the tail may have either ten or twelve feathers. The sexes are generally alike, and when any difference does occur, it is small.

All species have a complete autumn moult, in addition to a partial or complete spring moult. The spring moult is often accompanied by a distinct change in the shape and length of the tail. Several of our resident forms belong to species which undergo such a change. In this Island, however, such forms have a breeding season, which extends intermittently for over half the year, and it is interesting to note that in Ceylon birds the difference between the breeding and winter plumage is far less marked than in specimens from further north, where the breeding season is shorter and more defined.

The majority of the species are migratory, breeding in temperate regions and wintering further south. Not many of the migrant species, however, penetrate as far south as Ceylon, with the result that half the forms found with us are resident.

The Warblers have received their family name from their pleasing song, but as their vocal powers are generally exercised only in the breeding season, and as these powers are sadly lacking in our resident species, the name is rather misleading as far as Ceylon is concerned.

More than 100 species belonging to over 30 genera are found within Indian limits. Seventeen different species or subspecies have been recorded from Ceylon.

As the plumage generally is plain, and as the generic and specific distinctions are based on rather minute differences, the group presents certain difficulties, unless carefully studied. I have, however, endeavoured to make the key as simple and easy as possible. The forms found in Ceylon may be divided into three main groups:—

I.—Reed, Grass, and Bush Warblers with 12 tail feathers, short rounded feathers on the forehead, and without any bristles beyond the usual rictal bristles. Of these, we have eight species, nearly all of which are resident. They are

divided among seven genera. They are all restless little birds, which generally keep to reeds, long grass, or bushes, seldom taking long flights in the open. They spend most of their time actively threading their way among the grass-growth or foliage, to the upright stems of which their slim toes enable them to cling in the most characteristic attitudes.

II.—Tree Warblers, which have 12 tail feathers, and in which the feathers of the forehead are soft, disintegrated, and with somewhat produced shafts. In addition to the rictal bristles, there are some supplementary hairs in front of them. In *Hypolais* and *Sylvia*, however, these bristles are small, and are clearly visible only under a lens, in *Acanthopneuste* they are more strongly developed. Six species belonging to the above-mentioned three genera have been recorded from Ceylon. They are all migrants, and only two are regular visitors. They are generally found in trees, and not in bushes or long grass.

III.—Three resident and common species of Wren Warbler belonging to the genus *Prinia*, which has only 10 tail feathers. The feathers of the forehead are smooth, and there are no supplementary bristles. In their habits they much resemble the Grass and Bush Warblers with 12 tail feathers, and have the same attitudes when perching.

Key to Ceylon Sylviidae.

I.—Reed, Grass, and Bush Warblers, mainly resident. Tail of 12 feathers; feathers of the forehead short and rounded; no bristles on the margin of the forehead, except the ordinary rictal bristles near the gape.

A.—Under tail coverts extremely long; tail only normally broad.

(a) Outer tail feathers less than three-quarter length of tail.

(1) Upper plumage streaky; length under 5·5.
Locustella certhiola (Pallas' Grasshopper Warbler).

- (b) Outer tail feathers more than three-quarter length of tail ; plumage dingy and not streaky.

(1) Length 7·5 or over.

Acrocephalus stentoreus brunnescens (Indian Great Reed Warbler).

(2) Length about 5·5.

A. dumetorum (Blyths' Reed Warbler).

- B.—Under tail coverts more normal ; plumage extremely dark and soft ; tarsus long and stout ; length about 6·5.

Elaphrornis palliseri (Palliser's Warbler).

- C.—Small forms ; length under 5.

(1) Crown rufous ; back yellowish-green.

Orthotomus sutorius sutorius (Indian Tailor Bird).

(2) Upper plumage streaky.

Cisticola cursitans cursitans (Rufous Fan-tailed Warbler).

(3) Upper plumage ashy-brown.

Franklinia gracilis (Franklin's Wren Warbler).

- D.—Under tail coverts extremely long ; tail abnormally broad ; length about 6.

Schœnicola platyura (Broad-tailed Grass Warbler).

- II.—Migrant Tree Warblers. Tail of 12 feathers ; feathers of forehead disintegrated and with lengthened shafts. Some supplementary bristles in front of the rictal bristles.

- A.—No green in plumage, which is very plain.

(a) Length about 5. Forehead, crown, and upper plumage sandy-brown.

Hypolaïs caligata (Booted Tree Warbler).

(b) Length about 6. Forehead and crown gray or brownish-gray. Genus *Sylvia*.

(1) Crown dusky-gray ; upper plumage grayish-brown.

S. althæa (Hume's Lesser White-throated Warbler).

(2) Crown brownish-gray ; upper plumage earth-brown.

S. curruca affinis (Indian Lesser White-throated Warbler).

B.—Upper plumage some shade of green. Genus *Acanthopneuste*.

(1) Upper plumage bright green ; length about 5.
A. nitidus nitidus (Green Willow Warbler).

(2) Upper plumage dull green ; length about 4·2.
A. nitidus viridanus (Greenish Willow Warbler).

(3) Upper plumage very dark green ; length about 5·4.

A. magnirostris (Large-billed Willow Warbler).

III.—Resident Wren Warblers ; tail of 10 feathers ; plumage not streaked ; under tailcoverts normal. Genus *Prinia*.

A.—Upper plumage deep bluish ash-colour ; length about 4·75.

Prinia socialis socialis (Ashy Wren-Warbler).

B.—Upper plumage dusky-brown.

(1) Length 6 or over.

P. sylvatica robusta (Jungle Wren Warbler).

(2) Length about 5·25.

P. inornata jerdoni (Southern Wren Warbler).

LOCUSTELLA CERTHIOLA.

Pallas' Grasshopper Warbler.

Locustella certhiola (Oates, Vol. I., p. 352 ; Legge, p. 548).

Description.—Feathers of the head blackish-brown with olive-brown edges ; those of the back, scapulars, and wing coverts brownish-black with broad reddish-brown margins ; wing quills brown with pale rufous-brown margins ; rump reddish-brown ; upper tail coverts reddish-brown with a large black drop on each feather ; tail olive-brown with similar, but more irregular, black drops and rufous margins, the tips of all but the two central feathers whitish. A streak above the eye yellowish-white ; lores and a patch behind the eye brown ; chin, throat, and middle of abdomen whitish ; rest of lower plumage buff, darkening on the flanks and lower tail coverts to chestnut-brown.

In young birds the under parts are tinged with yellow, and many of the throat feathers have dark centres.

Bill, upper mandible dark brown, lower pale horn colour ; iris reddish-brown ; legs fleshy-brown.

Length about 5·3 ; wing 2·35 ; tail 2·3 ; tarsus ·85 ; bill from gape ·7.

Distribution.—Legge obtained two specimens in the Mutturajawela swamp, north of Colombo, in February, 1877. This is the only Ceylon record. This species breeds in Northern Asia, and winters chiefly in China and the Malay Archipelago, but is not uncommon in the north-east monsoon in portions of Burma and India.

Habits.—A skulking little bird, which may on occasions visit us unnoticed. It should be looked for in grassy swamps and paddy fields. It lurks in the thick grass, and does not rise until almost trodden on, when it darts out to take cover again almost immediately.

ACROCEPHALUS STENTOREUS BRUNNESCENS.

The Indian Great Reed Warbler.

Acrocephalus stentoreus (Oates, Vol. I., p. 356, Legge, p. 541).

Description.—Upper plumage olive-brown with a tinge of fulvous, more pronounced in some specimens, on the back and rump ; wings and tail brown, the outer webs edged with the hue of the back ; an indistinct pale eyebrow ; lores dark brown ; chin and throat grayish-white ; lower cheeks and sides of neck generally streaky brown and white ; lower parts from fore-neck pale fulvous, the flanks and the sides of the breast almost the hue of the back. In the breeding season the under parts are paler, and the feathers are much worn.

Bill, upper mandible dark brown, lower horny-pink ; iris yellowish-brown ; legs and feet plumbeous-black.

Length about 7·7 ; wing 3·2 ; tail 2·75 ; tarsus 1·05 ; bill from gape 1·02.

Distribution.—A resident among bulrush beds in swamps and tanks here and there in the dry zone of the low-country. Allied sub-species are migrant over a great part of India, breeding in Kashmir and other parts of the Himalayas or in Central Asia, and wintering in the plains.

Habits.—In Ceylon this Warbler appears to confine itself to bulrush beds. Its presence is generally detected by its harsh grating note, which is of great volume for the size of the bird. It is said to have a pleasing song in the breeding season. It is of very skulking habits, keeping mainly among the lower stems of the rushes and seldom showing itself. The food consists of flies and small insects. The breeding season is from June to August, and possibly also about March. The nest is a fairly deep cup of grass and strips of rush blades, lined with finer materials and wedged in among bulrush stems, to which the outer wall of the nest is attached. The two or three eggs are of pale greenish-gray, rather thickly, but irregularly, marked with blotches and spots of black yellowish-brown, and grayish-purple. Average size of eight Ceylon eggs .81 by .60.

ACROCEPHALUS DUMETORUM.

Blyth's Reed Warbler.

Acrocephalus dumetorum (Oates, Vol. I., p. 359; Legge, p. 545).

Description.—Ear coverts, sides of neck, and all the upper plumage olive-brown, paling slightly towards the tail coverts; the colour varies a little with different specimens; wings and tail deeper brown, edged on the outer webs with the hue of the back; an indistinct pale streak over the lores to the eye; lores dusky-brown; lower plumage pale buff, almost white on the chin, throat, and abdomen.

Bill dark brown, lower mandible horny-pink; iris olive-brown; legs, pale horn colour.

Length 5.5; wing 2.4; tail 2.1; tarsus .85; bill from gape .7.

Distribution.—A familiar migrant found during the north-east monsoon over the whole of the low-country and in the hills up to about 4,500 feet. It breeds on the Himalayas and in Northern Asia, and occurs in winter over all India and most of Burma.

Habits.—Unlike the other members of the genus this species avoids reeds, and is generally found skulking in thick bushes or low bushy trees, hunting for the small insects on which it feeds. On arrival in the Island it appears to remain with great regularity in the quarters which it has taken up for the season. It seldom appears in the open, but makes its presence known by its note, a sudden "chik." Towards the end of its stay it occasionally essays a slight warble, but its full song is developed only in the breeding season and so is not heard in Ceylon.

ELAPHRORNIS PALLISERI.

Palliser's Warbler.

Elaphrornis palliseri (Oates, Vol. I, p. 191; Legge, p. 514)

Description.—Upper plumage olive-brown with a rusty tinge on the rump, upper tail coverts, and tail; wings dark brown, edged on the outer webs of the feathers with the hue of the back; the centre of the tail feathers rather darker than the margins; a faint whitish streak over the eye; ear coverts dusky-brown; lores adjoining the gape whitish; underneath the eye dusky-brown; chin whitish, deepening into rusty buff on the throat and gorget; centre of abdomen yellowish; rest of lower parts slaty-olive, tinged with rufous on the flanks, thighs, and under tail coverts.

In young birds the chin is dusky-gray; there is a slight tinge of buff across the centre of the throat, while the breast and lower parts are more greenish than in adults.

Bill, black above, slate coloured beneath; iris clear red in males, buff in females; legs and feet deep brown or purple-brown.

Length 6·5; wing 2·4; tail 2·6; tarsus 1; bill from gape ·8.

The position of this species is not yet exactly determined. It shows in its plumage and structure affinities with both the *Timeliinæ* and the Warblers. The nest and eggs rather resemble those of a North Indian genus—*Tribura*—of Warblers, and it is now supposed to be an aberrant species of Warbler.

Distribution.—Peculiar to Ceylon, and confined to the main hill ranges over about 5,000 feet.

Habits, &c.—Fairly common in the dense undergrowth of the forests on the higher hill ranges. It seldom appears in the open, but threads its way under cover with great activity in search of insects and small seeds.

I once, however, watched a bird come out of the jungle and flit about the bushes in the garden of the Forest bungalow at Pattipola. It was intensely restless, never staying long in one position. Several of its attitudes were those of a Warbler, especially when it perched on a downward-hanging spray with its feet wide apart, the lower leg stretched out, and the upper bent almost double. The call is likened by Legge to the sound "quitze," and is a sharp insect-like note. It also has a rapid little warble.

The nest has been found by Captain Aldworth and by myself on the edge of the jungles round the Horton Plains in April. My nest was about 3 feet from the ground in a wild box bush, which stood by the side of a path where it ran through a little grassy space in the jungle. It was a fairly massive deep cup of moss, lined inside with carefully woven blades of soft dry grass. It contained two rather incubated eggs. They were oval, and only slightly pointed at the small end. The colour was whitish-pink, thickly powdered all over with rather deeper purplish markings and with one or two long hair-lines of deep brown at the larger end. Size .90 by .67.

ORTHOTOMUS SUTORIUS SUTORIUS.

The Indian Tailor Bird.

Orthotomus sutorius (Oates, Vol. I., p. 366; Legge, p. 517).

Description.—Forehead and crown rufous, shading into ashy on the nape; back, scapulars, rump, and upper tail coverts yellowish-green; wing quills and tail feathers lightish

brown, the latter with pale tips, a sub-terminal bar of darker brown, and bases of the same colour as the back ; wing coverts and innermost wing quills edged with the hue of the back, the primaries with narrow pale edges ; lores, checks, throat, and lower parts whitish, tinged with yellow ; the flanks and sides of the chest ashy-gray ; thighs rufous ; a concealed black patch on either side of the throat.

In the breeding season the male acquires an elongated tail, the central pair of feathers being about 2·5, while the next pair are also longer than in the off season.

Bill, flesh coloured, darker on the ridge ; iris reddish-yellow ; eyelid rufescent yellow ; legs reddish flesh colour.

Length : Males out of breeding season about 4·3 ; wing 1·85 ; tail 2 ; tarsus ·75 ; bill from gape ·65.

Females are slightly smaller and with shorter tails : wing 1·7 ; tail 1·25.

Distribution.—Found all over the Island from sea-level to the summits of the hill ranges. Various sub-species occur over the whole Indian Empire and extend into Siam and China.

Habits.—Equally common in town gardens open country, or thick jungle. It is generally seen in pairs flitting about in bushes or garden foliage. The birds make their presence known at all times of the day by their little grating "tewick, tewick" but they are wonderfully unobtrusive, and will often build, and bring up their young just outside one's verandah without attracting any notice. They are particularly restless when breeding. Their food is comprised mainly of small insects. They may be found breeding almost throughout the year, except during long periods of dry weather. The nest is a beautiful little structure of vegetable cotton, fine grass, or other soft materials lodged in a pocket made by sewing together the edges of one or two broad leaves. In Ceylon there are usually only three, very occasionally four, eggs. The ground colour is generally pale bluish-green, at times almost white or even pinkish, with fairly bold splashes of pale brownish-red, chiefly at the larger end. Average size ·63 by ·45.

CISTICOLA CURSITANS CURSITANS.

The Rufous Fantail Warbler.

Cisticola cursitans (Oates, Vol. I., p. 374; Legge, p. 531).

Description.—Males in breeding season: Forehead and sides of crown uniform sepia brown, the feathers on the centre of the crown and the nape more or less indistinctly edged with rufous-gray; the rest of the upper plumage deep brown with broad tawny margins to all the feathers; rump uniform rufous-tawny; wings and wing coverts dark brown with fulvous margins; tail deep brown with lighter edges, the feathers with broad whitish tips and blackish sub-terminal bands, which are seen most clearly on the under side; above the black bar is a rufous patch, which is mainly confined to the inner web. Lores and eyebrow whitish; face and ear coverts rufescent, the latter with pale shafts; throat and lower parts white, deepening on the flanks, under tail coverts, and thighs into pale rust colour.

In the off season the head is more streaked, and the rufous patches on the tail disappear.

Females at all seasons have streaky heads.

Birds from the hills are darker and more plainly streaked than those from the low-country.

Bill flesh colour, the ridge and tip darker; iris grayish-yellow, or pale olive; legs pinkish.

Length about 4·3; wing 2·1; tail 1·3; in the off season about 1·5; tarsus ·75; bill from gape ·6.

Distribution.—Found in paddy fields, swamps, and grassy country all over the Island from sea level to the Horton Plains. Various races occur throughout India and over a great part of the Old World.

Habits.—This tiny little Warbler may be met with in any stretch of paddy field, grassy flat, or patana. It may be recognized by its curious spasmodic flight and the sharp little “chick, chick” which it utters while on the wing. On alighting it threads its way very quickly through the grass and is soon lost to sight. It appears to breed intermittently from November until June or even later, and probably rears several broods during the year. The nest is a deep tubular

little structure placed generally in the middle of a tussock of grass; the outer wall is laced on to the surrounding grass blades, the interior is lined with vegetable down felted with cobwebs or saliva.

The three or four eggs are white, thickly spotted, generally in a zone round the larger end, with brownish-red and purple. Average size $\cdot 61$ by $\cdot 46$.

FRANKLINIA GRACILIS.

Franklin's Wren Warbler.

Franklinia gracilis (Oates, Vol. I., p. 376): *Prinia hodgsoni* (Legge, p. 523).

Description.—Male in breeding season: Upper plumage dusky ash-gray, the rump slightly paler, the wing quills dusky-brown with paler rufous edgings; the tail feathers with a whitish tip and a sub-terminal dusky patch seen most clearly on the under side; cheeks and lower parts white; the breast ash colour.

In the off season the upper plumage and tail are rufous-brown; the wings brown with broader rufous edges; the white of the lower parts is tinged with fulvous.

In females the pectoral band is lighter than in males, and not quite complete in the centre. They are slightly smaller than males.

Bill blackish, iris reddish, legs fleshy-yellow.

Length about $4\cdot 5$, wing $1\cdot 75$, tail $1\cdot 9$ (in the off season up to about $2\cdot 25$); tarsus $\cdot 7$, bill from gape $\cdot 55$.

Distribution.—This species appears to be confined to the south-east of the Island, its habitat being roughly bounded by a line drawn from Batticaloa through Madulsima and the southern slopes of the Uva range to the south coast, a few miles east of Tangalla. It occurs over the greater part of the Indian Empire.

Habits.—Decidedly a Bush and not a Grass Warbler. It frequents the edges of low jungle, underwood by the sides of paths, and deserted chenas in which the growth is springing up. It frequently goes about in little family troops. The flight is weak, and the usual note a feeble little twitter. The breeding season appears to be about June. The nest is rather

like that of a Tailor Bird, and is composed of fine grass stitched with cobwebs, silk, or wool, into the cavity of a leaf which is drawn round it. There seem to be three eggs; the ground colour is pale blue, in one type unspotted, in another finely speckled with brownish or purplish-red, often in a zone round the larger end. Average size $\cdot 59$ by $\cdot 42$.

SCHÆNICOLA PLATYURA.

The Broad-tailed Grass Warbler.

Schœnicola platyura (Oates, Vol. I., p. 384; Legge, p. 532).

Description.—In the breeding season the upper plumage including the sides of the head and neck, is ruddy-brown; wing quills darker brown with brighter margins; tail brown with distinct dark cross-rays, the tips of the feathers paler; lores and an indistinct streak above the eye whitish; chin, throat, and centre of abdomen pure white; rest of lower plumage tawny-brown.

In the off season the upper plumage is duller, the whole lower plumage is whitish fulvous, the colour being most pronounced on the breast and flanks; the under tail coverts are darker and tipped with dull white.

Bill black above, pale horny below; iris olive-brown; legs and feet pale brownish.

Length 6; wing 2·6; tail 2·7; tarsus ·9; bill from gape ·65.

Distribution.—A single specimen from Ceylon is in the British Museum. The exact locality is not known.

It is found on the west coast of India, from Belgaum to Travancore, and appears to be resident throughout its range.

Habits.—Possibly a rare resident species, which should be looked for skulking in the long grass at the edge of paddy fields and on the outskirts of the jungle. Messrs. Cave and Symons believe they once saw two specimens in lantana scrub near the Government bungalows in Colombo. In South India it breeds about September. The nest is a ball of grass, with the entrance at one side, and is placed in a tussock of grass close to the ground. The four eggs are white spotted with brownish-red, and measure about $\cdot 73$ by $\cdot 6$.

HYPOLAIS CALIGATA.

The Booted Tree Warbler.

Hypolais caligata (Oates, Vol. I., p. 393 ; not in Legge).

Description.—Upper plumage sandy-brown ; rump rather lighter ; wings and tail dusky-brown with paler margins, the outer tail feathers lighter and with broader, almost pearl white margins ; lores brownish ; a pale buff streak from the nostrils over the eye ; whole under plumage pale buff, the throat and centre of abdomen nearly white.

Bill brown above, fleshy below ; iris dark brown ; legs and feet pale brown.

Length 5 ; wing 2·35 ; tail 1·95 ; tarsus ·75 ; bill from gape ·55.

Distribution.—A recent addition to our list ; two specimens which have been kindly identified for me by Mr. Stuart Baker were procured by the Museum Collector on February 15, 1905, one at Mannar and one at Gaut's Tank, 14 miles away. The distance apart of these two localities would appear to indicate an incursion of this species that year. Another specimen was procured in the Mannar District in February, 1921. This Warbler summers in Turkestan and Southern Siberia, and winters generally in Northern and Central India.

Habits.—A slender little bird, which is of the same genus as the English Icterine Warbler. It flits about the lower branches of trees and among bushes in search of insects. A good lookout should be kept in the north-west of the Island from November to February for this and other rare migrant Warblers. It is quite possible that specimens visit us from time to time unnoticed.

SYLVIA ALTHÆA.

Hume's Lesser White-throated Warbler.

Sylvia althæa (Oates, Vol. I., p. 397 ; not in Legge).

Description.—Upper plumage mainly grayish-brown ; the crown rather dusky-gray, the back more tinged with brown ; wings dark brown with paler edges, the innermost quills almost the same hue as the back ; central tail feathers dusky-brown with pale margins, the outermost pair almost wholly

white, only the base of the inner web and the shaft being brown, the remaining feathers have white tips, which are often abraded; the lores, round the eye, and the ear coverts dark brown; lower plumage, including the edge of the wing and the wing-lining, ashy-white.

Bill brownish-black, slaty-blue at the base of the lower mandible; iris brown; legs and feet plumbeous black.

Length 6; wing 2·7; tail 2·5; tarsus ·85; bill from gape ·6.

Distribution.—Breeds in Kashmir and winters on the plains of India. There are several specimens in the Colombo Museum obtained at Mannar in February.

Habits.—A rare migrant, which should be looked for from November to February, especially in the north-west of the Island. It appears to keep chiefly to trees, but also frequents bushes, hedgerows, &c.

SYLVIA CURRUCA AFFINIS.

The Indian Lesser White-throated Warbler.

Sylvia affinis (Oates, Vol. I., p. 397; Legge, p. 538).

Description.—This form differs from *S. althæa* in being slightly smaller and having the plumage earth-brown with a grayish tinge; the forehead, crown, and nape are brownish-gray.

Bill dusky, slaty horn colour at the base of the lower mandible; iris yellowish-brown; legs and feet plumbeous.

Length about 6; wing about 2·55; tail 2·2; tarsus ·75; bill from gape ·55.

Distribution. The present sub-species is merely the eastern form of the Lesser White Throat, which is found over a great part of Europe. The eastern race breeds partly in Kashmir, but mainly, apparently, in Siberia, wintering in the plains of India. There is a specimen in the Colombo Museum from the Eastern Province.

Habits.—Like the last species, this is apparently one of the migrants which on rare occasions penetrate as far south as Ceylon in the winter. It may be looked for from November to February. The habits are much the same as those of the last species.

ACANTHOPNEUSTE NITIDUS NITIDUS.

The Green Willow Warbler.

Acanthopneuste nitidus (Oates, Vol. I., p. 413); *Phylloscopus nitidus* (Legge, p. 551).

Description.—Upper plumage and sides of neck fairly bright yellowish-green; wing coverts, wings, and tail brown, edged with the hue of the back, the greater coverts with pale yellow tips, forming a slight wing bar; lores and behind the eye olive; a distinct yellow streak from the nostrils over the eye to the nape; under parts almost primrose yellow; the wing-lining brighter yellow.

Bill brown above, paler beneath; iris dark brown; legs and feet olive-gray.

Length about 5; wing 2·4; tail 2; tarsus ·8; bill from gape ·6.

Distribution.—A fairly common visitor during the north-east monsoon over the whole Island. It is found in winter throughout practically the whole of India westwards of Calcutta. Its summer quarters are probably in Kashmir and on the Himalayas.

Habits.—Generally seen in the upper branches of leafy trees, being especially fond of jak trees. It keeps up a perpetual little chirrup, and like the Flycatchers, darts out from its perch to capture passing insects.

ACANTHOPNEUSTE NITIDUS VIRIDANUS.

The Greenish Willow Warbler.

Acanthopneuste viridanus (Oates, Vol. I., p. 414); *Phylloscopus viridanus* (Legge, p. 555).

Description.—Upper plumage dull olive-green, lighter on the rump; wing and tail quills brown, edged with olive-green; the wing coverts with broader olive edges, and the greater coverts with tips of the same colour, forming a wing bar; a yellowish stripe over the eye; lores and behind the eye brown; ear coverts greenish-yellow; lower plumage pale grayish-yellow; wing-lining pale yellow. In summer the plumage is paler, and just before the moult the wing bar often disappears owing to the abrasion of the tips of the coverts.

Bill dusky-brown above, paler below; iris dark brown; legs and feet brownish-gray.

Length 4·2; wing 2·2; tail 1·7; tarsus ·7; bill from gape ·6.

Distribution.—This sub-species breeds in some part of the Himalayas and winters over a great part of India. Stray specimens probably visit Ceylon on occasions.

There is a single specimen in the Colombo Museum obtained at Ratnapura in March, 1909.

Habits.—Much the same as those of the preceding sub-species. Specimens may be looked for during the north-east monsoon.

ACANTHOPNEUSTE MAGNIROSTRIS.

The Large-billed Willow Warbler.

Acanthopneuste magnirostris (Oates, Vol. I., p. 415); *Phylloscopus magnirostris* (Legge, p. 553).

Description.—Upper plumage very dark olive-green, darkest on the head; wing coverts and wing brown, edged with rather brighter olive-green, the median coverts have small and the greater coverts broader yellowish-white tips, forming two wing bars; these bars tend to disappear towards the moulting season owing to abrasion; tail feathers brown, with olive-green edges on the outer webs and pale tips on the lower surface. A yellowish-white streak over the eye; lores and behind the eye brown; lower plumage pale grayish-yellow; wing-lining pale yellow.

Bill dusky-brown above, paler beneath; iris earth-brown; legs and feet bluish-gray.

Length 5·4; wing 2·7; tail 2·2; tarsus ·75; bill from gape ·65.

Distribution.—Like other Willow Warblers, this species breeds on the slopes of the Himalayas, and visits a great portion of India in winter. During the north-east monsoon it is common in many parts of the Island, especially in the drier forest tracts. It also occurs on the hills.

Habits.—Unlike the Green Willow Warbler, this species is not found near civilization, but prefers the jungle, where it

keeps to the upper branches of trees. In its ways it resembles the Flycatchers, and its call is a whistle of three notes, which also rather resembles that of Tickell's Flycatcher.

PRINIA SOCIALIS SOCIALIS.

The Ashy Wren Warbler.

Prinia socialis (Oates, Vol. 1., p. 450 ; Legge, p. 520) ; *Prinia brevicauda* (Legge, p. 1216).

Description.—Upper plumage, including the head to just below the eyes dark bluish ash colour ; wings and tail umber-brown, the tail feathers are slightly cross-rayed and have whitish tips and sub-terminal black patches seen most plainly on the under side ; wing coverts umber-brown, more or less washed with the hue of the back ; lower parts and edge of the wing rusty-buff, the centre of the breast and throat almost white, the thighs and flanks darker.

In the off season there is no great difference. The hue of the back is a little more brown, the wing coverts less tinged with ashy, and the tail about $\cdot 3$ inch longer. According to Legge, females have a more or less distinct streak of buff just above the lores and are paler underneath.

Bill black ; iris pale red or brownish-yellow ; legs and feet fleshy-red.

Dimensions a little variable. Length in breeding season about $4\cdot 75$; wing $1\cdot 85$; tail $1\cdot 8$; tarsus $\cdot 75$; bill from gape $\cdot 6$; in winter the tail measures up to $2\cdot 1$.

Distribution.—Fairly widely distributed over the Island, but nowhere very numerous. The species divided into various geographical races is found almost throughout India proper.

Habits.—This Wren Warbler is a permanent resident in the long *mana* grass of the patanas in Uva and elsewhere. In the low-country it wanders about a good deal, visiting fields of guinea grass when they are in growth and disappearing when they are cut. It is more permanent in the long grass round tanks and paddy fields and on the edges of jungle. The flight is feeble, but the birds are very active in threading their way through long grass stalks. The note is a feeble little warble. I have found the eggs in Uva in June and in the Puttalam

District from December to March. The nest is said occasionally to resemble that of the Tailor Bird, but is generally a neat little doomed structure of grass with the opening at one side. It is placed not far from the ground among tall grass stems, to which the outer wall is laced. The three eggs are of a glossy mahogany-red, the colour being deeper at the large end. Average size $\cdot 63$ by $\cdot 47$.

PRINIA SYLVATICA ROBUSTA.

The Jungle Wren Warbler.

Prinia sylvatica (Oates, Vol. I., p. 451); *Drymæca valida* (Legge, p. 525); *Drymæca jerdoni* (Legge, p. 527).

Description.—Upper plumage dusky-brown with an ashy tinge on the sides of the neck; the margins of the wing and tail feathers a little brighter; the tail feathers have a whitish tip and a sub-terminal black spot, these marks show more plainly on the under surface, and are almost absent in the central pair; the whole tail is faintly cross-rayed; a whitish streak on the lores; cheeks brownish, blending into the pale buff of the chin and throat; the buff tinge is a little deeper on the chest and flanks; abdomen whitish; thighs and lower tail coverts pale fulvous brownish.

In Ceylon the seasonal change appears to be much less marked than in the North Indian races, in which the bill becomes paler, the plumage brighter, and the tail distinctly longer than in summer. Mr. Stuart Baker suggests that the smaller seasonal change may be due to the extended breeding season in Ceylon; our birds moulting at different times, whenever they happen to have finished breeding. The only difference I can find is that some specimens have paler bills than others. These are Legge's *Drymæca jerdoni*, and are probably either young birds or specimens in the off season.

Bill black, at times brownish, with a paler lower mandible; iris hazel; legs and feet fleshy.

Dimensions a little variable: length 6 to 6·4; wing 2·2 to 2·5; tail 2·4–2·8; tarsus $\cdot 8$; bill from gape $\cdot 73$.

Distribution.—The Jungle Wren Warbler is found almost throughout India proper west of Calcutta. It is divided into several sub-species, the Ceylon form being distinguished by

its much darker colour and smaller seasonal change. It is found over most of the low-country and up to about 3,000 feet, but on the Uva patanas it ascends to considerably higher elevations.

Habits.—A common species in low grassy jungles, in scrub by the sides of roads and paddy fields or in young chena growth, patanas, fern lands, &c. The note is a fairly loud chirp. The diet is insectivorous. The breeding season lasts from October to June. The nest is a woven ball of grass, with the opening at one side, and is placed low down in coarse grass or a thorny bush. Three or occasionally four eggs are laid. The ground colour is of fairly glossy pinkish-white, finely freckled all over with pale red. These markings often concentrate into a more pronounced zone or cap at the large end. I have seen two abnormal clutches and one egg of a normal clutch, in which the ground colour was clear white and the red freckles very faint and few. Average size $\cdot 71$ by $\cdot 51$.

PRINIA INORNATA JERDONI.

The Southern Wren Warbler.

Prinia jerdoni (Oates, Vol. I., p. 453); *Drymæca insularis* (Legge, p. 529).

Description.—Upper plumage dull earthy-brown, the centre of the feathers slightly darker; forehead and forepart of crown tinged with rufous; rump much paler; wing and tail feathers brown with pale fulvous edges; the central tail feathers cross-rayed faintly; tips of tail feathers white with a sub-terminal black spot, which shows most plainly on the under side; a pale streak from the nostrils over the eye and a narrow white ring round the eye; lores at the corner of the eye brownish; lower plumage pale buff; the sides of the chest and belly more strongly coloured; flanks with a dusky tinge; thighs rusty-brown.

There is very little difference either in the plumage or in the length of the tail in the off season, though, on the whole, the plumage is slightly darker then. The seasonal change is far more marked in North Indian forms.

Bill black, the basal half of the lower mandible pale horny; iris pale reddish or reddish-yellow; legs and feet fleshy-pink.

Length about 5·25 ; wing 1·9 ; tail 2 to 2·3 ; tarsus ·8 ; bill from gape ·65.

Distribution.—This species has a wide range over India and Burma, and is divided into several sub-species. The Ceylon form occurs also in South Travancore. With us it is common round tanks and in paddy fields and grass lands in the low-country ; on the hill patanas it occurs as high as 5,000 feet.

Habits.—The flight is weak and jerky, and the call a little “ kink, kink, kink.” The birds feed mainly on small insects and larvæ. The breeding season starts with the earliest rains in October or November, and lasts intermittently till June or even later. The nest is a neat little purse-shaped structure woven of thin strips of grass or reeds, the outer wall being laced round the long stems of grass in which it is placed. The opening is at one side. In the low-country the site generally chosen is a clump of reeds or long grass growing in or near water. Three or four eggs are laid ; the ground colour is a beautiful clear blue with bold blotches in various shades of chocolate-brown and generally some interlacing lines of the same shade at the larger end. Average size ·60 by ·45. It is interesting to note that the ground colour of the eggs in the different sub-species varies considerably. Those from Ceylon are the deepest blue, further north the colour is not so rich ; in Oudh it is white, and in Burma pink.

Family LANIIDÆ.

Shrikes.

The *Laniidæ* form a family group in which the plumage of the young is cross-barred, generally both above and below. All the members are insectivorous, and some of the larger true Shrikes tackle small birds, mice, frogs, &c. The bill is strong and generally both hooked and notched. Rictal bristles are present. The nostrils are clear of the line of the forehead, and are more or less overhung by bristles and hairs. There are ten primary quills and twelve tail feathers. There is only one moult a year in autumn.

Shrikes are found all over the world, except in South America, but are most numerous in Africa.

The family is divided into two sub-families :—

(1) *Laniinæ*, which comprises our true Shrikes, Pied Shrike, Wood Shrike, Minivets, and Cuckoo Shrikes.

In all these forms the first primary is not excessively small, and the folded wings do not reach beyond the middle of the tail.

(2) *Artaminæ*.—Swallow Shrikes—in which the forked wings reach to the tip of the tail ; the first primary is very minute, and the second primary the longest in the wing.

Sub-family *Laniinæ*.

True Shrikes, &c.

This sub-family contains rather a varied series of forms, most of which are wholly arboreal. The head is large for the size of the bird, and the crown is broad and flat. They may be divided into two groups. First, the true Shrikes, Pied Shrike, and Wood Shrike, in which the sexes are alike, or do not differ greatly, and the shafts of the rump feathers are soft. This group includes five species found in Ceylon : Three true Shrikes with predaceous bills and a distinctive mask-like, dark band across the face from the nostrils to the ear coverts ; the tiny Black and White Pied Shrike with a broad flat bill and the habits of a Flycatcher ; and the Wood Shrike an inconspicuously coloured little bird, with a strong bill well hooked and notched. The second group, in which the sexes, as a rule, are markedly different, and the shafts of the rump feathers are stiffened, contains four Ceylon species, the two gaily coloured little Minivets and two Cuckoo Shrikes. The latter are not so gaudily coloured and include one species, of the genus *Graucalus*, which is our largest Shrike. The sexes in this species do not differ greatly.

Key to Ceylon Laniinæ.

I.—Shaft of rump feathers soft ; sexes similar or almost so.

A.—Outer tail feathers much shorter than inner ; wing pointed.

(a) Bill deep and narrow, the tip well hooked and notched ; a conspicuous dark band from the nostrils through the eye to the ear coverts.
Genus *Lanius*.

- (1) Length about 9 ; forehead black ; crown and back pale gray.

L. schach erythronotus (Rufous-backed Shrike).

- (2) Length about 7·5 ; forehead white ; crown rufous, and darker than the back.

L. cristatus (Brown Shrike).

- (3) Length 8 ; forehead and front of crown grayish-white ; back of crown grayish-brown, like the back.

L. lucionensis (Philippine Shrike).

- (b) Bill broad and flat, not greatly hooked ; size small ; length not quite 5·5.

- (1) Cap of head and back glossy black.

Hemipus picatus picatus (Black-backed Pied Shrike).

B.—Tail square ; wing blunt ; bill strong, the tip well hooked and notched.

- (1) Length about 6·25 ; upper plumage almost uniform ashy-gray.

Tephrodornis pondicerianus (Common Wood Shrike).

II.—Shaft of rump feathers spiny ; sexes generally markedly dissimilar ; wing pointed.

A.—Outer tail feathers less than half length of tail ; upper tail coverts fiery red, or bright yellow ; bill strong, legs weak. Genus *Pericrocotus*.

- (1) Length 7·75 ; upper tail coverts red in males, yellow in females.

P. flammeus (Orange Minivet).

- (2) Length just under 6 ; upper tail coverts red in both sexes.

P. peregrinus malabaricus (Small Minivet).

B.—Outer tail feathers more than three-quarters length of tail ; upper tail coverts some shade of gray.

- (1) Length 7·75 ; bill comparatively weak ; males : head black, back slate gray ; females : upper plumage uniform brownish-gray.

Campophaga sykesi (Black-headed Cuckoo Shrike).

- (2) Length 10·25 ; bill massive ; sexes almost similar ; upper plumage almost uniform slate gray.

Graucalus macii (Large Cuckoo Shrike).

LANIUS SCHACH ERYTHRONOTUS.

The Rufous-backed Shrike.

Lanius erythronotus (Oates, Vol. I., p. 464) ; *Lanius caniceps* (Legge, p. 383).

Description.—Forehead and a broad band through the eye to the ear coverts black ; crown, nape, hindneck, sides of neck, back, and scapulars pale gray, with a white edging, more pronounced in some birds than in others, adjoining the frontal band ; the ends of the scapulars more or less tinged with pale rufous ; rump, upper tail coverts, and flanks rust colour ; wing coverts and wing quills black, more or less edged with white or pale rufous, this is most noticeable on the inner quills ; the edge of the wing and a band at the base of the inner primaries white ; the three central pairs of tail feathers black, the rest brown with paler edges ; chin, throat, and upper breast white ; abdomen and lower tail coverts tinged with rust colour.

In young birds the upper plumage is pale sandy, darkening into rufous on the rump, and with wavy bars of brown ; the central tail feathers are brown, tipped with rufous, and the band through the eye is blackish-brown.

Bill black ; iris hazel ; legs and feet blackish-brown.

Length 9 ; wing 3·6 ; tail 4·5 ; tarsus 1·05 ; bill from gape ·9.

Distribution.—Restricted to the Jaffna peninsula and the north-west of the Island. The species ranges over the whole of the Indian Empire to China and the Malay Archipelago, and is divided into various geographical races.

Habits.—Fairly common in scrub jungle near the sea throughout its range. It is rarely found far inland. It perches on the tops of trees and bushes, darting down to the ground on its prey, which consists chiefly of grasshoppers, and returning to its perch. It also feeds on frogs, which it impales on thorns in the regular Butcher Bird fashion. It is noisy and restless in the mornings and evenings, uttering its harsh cry and flying from bush to bush. The birds breed from February till about May, building a cup-shaped nest of rough grass, stalks, and slender twigs, lined with rootlets or other soft material, and placed in a thorn bush. The eggs appear to be four in number. The ground colour is pale greenish or creamy-white, with blackish-brown spots, which frequently form a zone at the larger end. Average size $\cdot 91$ by $\cdot 70$.

LANIUS CRISTATUS.

The Brown Shrike.

Lanius cristatus (Oates, Vol. I., p. 468 ; Legge, p. 377).

Description.—Adult male : Forehead and a streak over the eye white ; a broad black band from the nostrils through the eye to the ear coverts ; the rest of the upper plumage and the lesser wing coverts reddish-brown, the colour being brightest on the crown, nape, and sides of the neck ; the larger wing coverts and the wing quills dark brown with rufous edges, which are broadest on the secondaries : tail feathers reddish-brown with paler tips ; cheeks, chin, and throat white ; rest of lower plumage fulvous.

In females the black streak through the eye is smaller and brownish.

In young birds on their first migration the crown and back are of the same rufous brown hue ; the lower surface is largely marked with wavy, narrow bars, especially on the breast and flanks ; these bars disappear very gradually, most birds retaining slight traces of barring on the flanks.

The tip of the bill and the greater part of the upper mandible blackish, the remainder pale bluish ; iris dark brown ; legs and feet bluish-gray to blackish slate-colour.

Length 7·5 ; wing 3·45 ; tail 3·4 ; tarsus 1 ; bill from gape $\cdot 85$.

Distribution.—A common migrant during the north-east monsoon. It spreads over nearly all parts of the Island, but is most numerous near the sea, especially in the dry zone. The species has a wide range, breeding in Tibet, Mongolia, and Siberia, and wintering in Southern Asia, from Southern China to India.

Habits.—Found in scrub land, hedgerows, the borders of jungle, &c. A restless bird, perching on the tops of bushes and uttering a harsh ill-tempered cry. It feeds chiefly on insects, especially grasshoppers, but occasionally takes small birds.

LANIUS LUCIONENSIS.

The Philippine Shrike.

Lanius lucionensis (Oates, Vol. I., p. 469 ; Legge, p. 378).

Description.—Adult male : The forehead, the front of the crown, and a streak over the eye grayish-white ; a broad black band from the nostrils through the eye to the ear coverts ; hinder part of crown, back, scapulars, and sides of neck grayish-brown ; rump and upper tail coverts more rufous ; wing coverts and quills blackish-brown with pale rufous edgings, broadest on the innermost quills ; tail feathers rufous-brown, with paler margins ; chin, throat, and sides of neck white ; rest of lower parts pale buff.

In females the black streak through the eye is smaller and the under parts paler.

In young birds the upper parts are brownish-rufous with faint dark bars on the plumage ; the lower parts are wavyly barred with brown.

The tip of the bill and most of the upper mandible dark brown, remainder paler ; iris brown ; legs and feet dull lead blue.

Length 8 ; wing 3·5 ; tail 3·5 ; tarsus ·9 ; bill from gape ·87.

Distribution.—A very rare north-east monsoon migrant ; it appears to have been seen in Nuwara Eliya and one or two other localities, and there is a fine specimen in the Colombo Museum taken at Haldummulla in February, 1906. This Shrike breeds in Northern China and winters chiefly in the

Philippines and Malay Peninsula. It occurs in the extreme South of Burma and in the Andamans, where it appears to be an occasional resident.

Habits.—Very much the same as those of the last species.

HEMIPUS PICATUS PICATUS.

The Black-backed Pied Shrike.

Hemipus picatus (Oates, Vol. I., p. 471 ; Legge, p. 375).

Description.—Crown, sides of head to a line a little below the eye, and most of upper plumage deep black, slightly glossed with green ; a more or less incomplete white collar across the back of the neck ; the feathers of the lower back and rump long and fluffy, the former mixed with and the latter broadly tipped with white ; wing coverts black with a white bar across the median coverts and the inner greater coverts ; wing quills black with white edges on some of the secondaries ; tail black, all save the middle feathers tipped with white, on the outer feathers the white extends to a large portion of the outer webs ; chin, cheeks, sides of neck, vent, and under tail coverts white ; rest of lower parts pinkish-ash colour.

In Ceylon specimens the females appear similar to the males.

Bill black ; iris reddish-brown ; legs and feet blackish.

Length 5·3 ; wing 2·3 ; tail 2·25 ; tarsus ·45 ; bill from gape ·7.

Distribution.—This small Shrike ranges over a large part of India and Burma, and extends east and south-east to Siam and Cochin-China. The sub-species found in Ceylon also occurs in the Indian Peninsula. It is widely distributed over most of the Island wherever there is forest or heavy jungle, but is commonest in the hills.

Habits.—Generally found in pairs in tall trees near the edge of forest or high jungle. It is plentiful about many up-country estates, where it is commonly misnamed the Black and White Flycatcher owing to its habit of darting out from its perch and catching its food, which consists entirely of insects, on the wing, much in the manner of the true Flycatchers. It is really far from shy, but owing to its fondness for the top branches of tall trees it frequently escapes notice. The constantly uttered little call is likened by Legge to the syllables

“tcheetiti, tcheetiti, tcheetiti—chee.” The breeding season probably extends from about February to May. The nest, which is hard to find, is a neatly made shallow little cup of grass and fine roots, covered outside with cobweb and flakes of lichen, and lined inside with soft fibres. It is placed in a fork or on top of a branch at some height from the ground. There are generally three eggs. They are elongated ovals in shape. The ground colour is greenish-white mottled with darker green and brown. Average size (of South Indian eggs) .69 by .49.

TEPHRODORNIS PONDICERIANUS.

The Common Wood Shrike.

Tephrodornis pondicerianus (Oates, Vol. I., p. 475); *Tephrodornis pondiceriana* (Legge, p. 372).

Description.—Upper plumage from forehead to tail coverts dark slaty-gray to ashy-brown, the tint varying with individuals; rump feathers tipped with white, upper tail coverts very dark brown; great wing coverts and wing quills rather more brown than the back, the inner quills with pale edges; tail feathers dark brown, the two outer pairs white, except at the base and tip; a more or less distinct whitish streak above the eye and a band of dark brown from the nostril through the eye to the ear coverts; this is bordered below by another whitish streak, which includes the chin and centre of the throat; rest of lower parts ash colour, which gradually merges on the abdomen into the white of the lower tail coverts.

According to Legge the browner specimens come from the north, but in the Colombo Museum there is a gray bird from the Northern Province, and both gray and brown birds from the Central and Southern Provinces; the difference appears to be largely individual.

Nestling birds are paler, are conspicuously spotted with white on the head, and have wavy markings on the wings; these markings gradually disappear.

Bill dark horn colour, lighter beneath; iris yellowish-brown; legs and feet dusky-slate colour.

Length 6.2; wing 3.3; tail 2.5; tarsus .7; bill from gape .9.

Distribution.—Rather locally distributed, but occurs over the low-country and up to about 5,000 feet in the hills. It ranges over practically the whole of the Indian Empire.

Habits.—Generally found in low spreading trees, such as *kaju* or *suriya*, round village compounds, by the roadside, on the edge of the jungle, &c. It is, for instance, fairly abundant in the avenues of *suriya* trees along the roads round Puttalam. It keeps very much to the shelter of the trees, hopping about among the leafy branches in search of insects. The cry is rather a plaintive little "weet, weet, weet."

The breeding season is from February to June. The nest is a very shallow cup, carefully felted into a fork, or on to the top of a bough, and so covered externally with lichen and cobwebs as to seem a mere natural excrescence of the bark. The lining is composed of soft fibres. The eggs, three in number, are dumpy ovals of pale grayish or greenish-white, rather thickly blotched with grayish-purple and brown. Average size .77 by .60.

PERICROCOTUS FLAMMEUS.

The Orange Minivet.

Pericrocotus flammeus (Oates, Vol. I., p. 482 ; Legge, p. 363).

Description.—Adult male : The whole head, throat, back, and scapulars glossy black ; lower parts from breast downwards, rump, and upper tail coverts brilliant orange-red ; wing coverts and quills black with a broad band of the same colour as the rump running across the quills from the outer web of the fifth primary ; a spot of the same fiery hue on the ends of the inner secondaries and of the greater coverts ; central tail feathers and the bases of the others black, remainder of tail fiery orange-red ; thighs dusky-black.

Females : On the wings and tail the orange-red markings of the male are replaced by bright yellow ; forehead and entire under plumage also bright yellow ; rump and upper tail coverts greenish-yellow ; top of head, hind-neck, back, scapulars, and lesser wing coverts dark bluish-gray ; lores almost black.

Immature males resemble females ; as they grow older they gradually assume adult plumage, birds in the transition state having a very patchy appearance.

Bill, legs, and feet black; iris reddish-brown in males, brown in females.

Length about 7·75; wing 3·55; tail 3·55; tarsus ·6; bill from gape ·8.

Distribution.—Found both in the hills, where it is fairly common, and in the low-country, where it is local. Both this and the next species appear to wander about a good deal, and some birds may be migrants from India, where this species appears to be confined to the Western Ghats.

Habits.—May be met with in the tops of trees in hill forests and patana woods. In the low-country it usually keeps to the big trees along river banks and round tanks. Out of the breeding season it usually occurs in little troops of one cock and several hens. The nest has been found in Uva in December, but the breeding season probably continues throughout the north-east monsoon. The nest is rather a thick-walled little cup composed of the finest twigs and coated externally with cobwebs and lichen. It is generally placed high up in a tree and is glued into a small fork, or on to the top of a slender bough. The eggs apparently two in number, are of pale sea green, marked with pale yellowish-brown and grayish-purple. Average size (of Indian eggs) ·90 by ·67.

PERICROCOTUS PEREGRINUS MALABARICUS.

The Small Minivet.

Pericrocotus peregrinus (Oates, Vol. I., p. 487; Legge, p. 366).

Description.—Male: Forehead, top of head, hind-neck, back, and lesser wing coverts dark ashy-gray; lores, cheeks, ear coverts, chin, and throat black; rump and upper tail coverts scarlet, with generally a whitish band at the junction with the gray of the back; the greater wing coverts and wing quills black, with a band of orange red across the inner primaries and the secondaries; the three central pairs of tail feathers black, the next pair with a broad orange red tip, the outer feathers orange red, except at the base; breast and flanks scarlet, the hue paling across the abdomen to orange-yellow on the vent and lower tail coverts.

Female : The gray parts of the upper plumage are more ashy ; wings and tail brownish, with much paler markings than in the male ; lower parts whitish-gray on the throat and breast, gradually changing into faint orange-yellow on the abdomen and lower tail coverts.

Bill black ; iris brown ; legs and feet black in males, brownish-black in females.

Length 5·9 ; wing 2·65 ; tail 2·65 ; tarsus ·6 ; bill from gape ·6.

Distribution.—This Minivet, divided into several geographical races, ranges over practically the whole Indian Empire and eastwards into Siam and Cochin-China. The present subspecies occurs in Ceylon and Malabar. It is found in suitable localities over most of the Island, but is more abundant in the north than in the damper south-west. It is fairly well distributed in the hills.

Habits.—Goes about in small troops, and has much the same habits as the preceding species, but is generally met with close to civilization, and not in the interior of forests. It is occasionally seen in Colombo. It feeds chiefly on larvæ and small insects. It appears to breed in April and May. The nest is a tiny edition of that of the Orange Minivet, and is placed in the same situations. The eggs are greenish-white, marked with brown and purple, and measure about ·7 by ·52.

CAMPOPHAGA SYKESI.

The Black-headed Cuckoo Shrike.

Campophaga sykesi (Oates, Vol. I., p. 493) ; *Lalage sykesii* (Legge, p. 369).

Description.—Male : Head, chin, throat, neck all round, and upper breast black ; back, scapulars, lesser wing coverts, and upper tail coverts slate gray, the tail coverts with paler margins ; median and greater wing coverts black with gray at the tips and on the outer webs ; primary coverts black with a narrow white edge on the outer webs ; primary quills black with narrow white edges to the outer and a large white patch on the inner webs ; secondaries with broader white borders and with a certain amount of gray on the outer webs of the

innermost quills; the central pair of tail feathers gray, the rest black, tipped with white; chest and flanks pale gray; abdomen, vent, and lower tail coverts white.

Female: The upper plumage, including the lesser wing coverts, brownish-gray; the rump and upper tail coverts rather lighter and with narrow dusky bars; the rest of the wing coverts and wing quills dusky-brown with fulvous white edges, the primaries with a large basal patch of the same colour on the inner webs; central tail feathers brownish-gray, darkening to brown at the tips, and with faint pale margins, the remainder blackish-brown with white tips; ear coverts streaked with white; cheeks, sides of neck, and lower plumage fulvous white, with numerous narrow dusky-brown bars, which disappear on the abdomen; vent and under tail coverts white.

In nestlings the lower surface is more closely barred than in the female; the upper plumage is slaty-brown, each feather with a white tip and a dusky sub-terminal bar.

Bill black; iris brownish-red in males, brown in females; legs and feet black in males, brownish-slate in females.

Length 7.5; wing 3.9; tail 3; tarsus .8; bill from gape .85.

Distribution.—Found over the greater part of the low-country, but most common in the maritime districts of the south-east and north. It ascends the hills to about 4,000 feet, and occasionally wanders to higher elevations. It occurs over the greater part of India proper.

Habits.—May be met with in a variety of situations, either in forest, low scrub jungle, hedgerows, or compounds. It is occasionally seen in Colombo. Out of the breeding season the males are solitary, the females and young associate in small troops. The birds hunt diligently among the foliage for larvæ and soft insects. Males have a clear whistle, females a chirping note. The breeding season appears to be about April. The nest is a small shallow cup made of fine twigs bound together with cobwebs and placed in the fork of a tree, often at the end of a horizontal branch. The two eggs are greenish-white, rather streakily marked with pale brown, and measure about .86 by .62.

GRAUCALUS MACII.

The Large Cuckoo Shrike.

Graucalus macii (Oates, Vol. I., p 496); *Graucalus macii* (Legge, p. 360).

Description.—Male : nostrils, lores, the feathers round the gape, and under the eye black ; ear coverts blackish ; upper plumage, face, and sides of neck slate-gray, sometimes with a bluish tinge ; rump and upper tail coverts paler and with whitish tips ; chin, throat, breast, and upper abdomen rather lighter gray, paling into white on the lower abdomen and vent ; wing-lining and under tail coverts white ; wing coverts blackish-gray with black shafts ; wings black, the quills edged with white, and the outer webs of the inner feathers largely gray ; central tail feathers ashy-gray, darker at the end and with pale tips, remainder black with grayish-white tips, the feathers towards the centre with gray bases. Most birds retain traces of darker cross-bars on the under surface.

In females the nostrils, lores, and ear coverts are brownish and the general tone of the plumage lighter.

In immature birds the lower parts are more or less heavily barred ; in very young birds the upper plumage is tipped and margined with pale fulvous, and the lower parts are nearly pure white.

Bill, legs, and feet black ; iris reddish-brown.

Length about 10·25 ; wing 5·9 ; tail 4·4 ; tarsus 1·05 ; bill from gape 1·35.

Distribution.—Not very abundant, but fairly widely distributed in the drier forest tracts of the low-country. It also occurs in Uva and at other medium elevations, where the rainfall is not too heavy. It ranges over practically the whole of the Indian Empire.

Habits.—Rather a shy forest bird, generally found in tall trees, especially in the neighbourhood of rivers and tanks. Single specimens are to be met with, but immature birds generally associate in small troops. The cry is a harsh “kur-eech.” The food consists of caterpillars, beetles, &c. It breeds apparently in July and August, chiefly in palu trees. The nest, which is small for the size of the bird, is a shallow cup of small twigs, lined inside with grass and leaves, and

felted with cobwebs to the top of a branch, or in a fork high up in the tree. The three eggs are pale green, marked with brown and purple, and measure about 1·22 by ·9.

Sub-family *Artaminae*.

Genus *Artamus*.

Swallow Shrikes.

These are birds of rather swallow-like form with long wings, which enable them to spend much of their time in the air. They feed on insects, which they capture invariably on the wing. They are easily recognized by the strong conical pale blue bill, which is slightly curved and pointed, but neither hooked nor notched. The nostril is nearly circular and almost entirely exposed. The first primary is very minute, but the second reaches to the tip of the wing. The tail is short and square; the legs and feet weak. The plumage is plain, and there is no difference between the sexes. Swallow Shrikes are found from India to Australia. Only one species occurs in Ceylon.

ARTAMUS FUSCUS.

The Ashy Swallow Shrike.

Artamus fuscus (Oates, Vol. I., p. 498; Legge, p. 666).

Description.—Lores black; head and hind-neck slate gray; back, scapulars, and rump smoky-brown, with a slight reddish tinge in fresh specimens; upper tail coverts whitish; wings and wing coverts dark slate gray, the larger primaries almost dull brown on the exposed portions, all the quills with a very narrow whitish margin on the tips and inner webs; tail dark gray, almost brown, with a whitish tip; chin, cheeks, and fore-neck slate gray, the chin and cheeks tinged with black; lower parts from the chest downwards dove gray with a vinaceous tinge, paling to white on the inner tail coverts, which are crossed with narrow, wavy, gray bars.

In young birds the upper plumage is duller, and the feathers have faint paler margins; the secondaries and inner primaries have broad white tips.

Bill milky-blue, blackish at the tip; iris dark brown; legs and feet slate colour.

Length 7·3; wing 5·2; tail 2·25; tarsus ·65; bill from gape ·95.

Distribution.—Widely distributed over the low-country. It is fairly common in Uva, but rarer in the Central ranges. In some districts it appears to be a partial migrant. It occurs throughout the greater part of the Indian Empire, and extends into Siam and China.

Habits.—May be found in small flocks round paddy fields, on open hillsides, tree-studded patanas, or clearings in the jungle. The birds perch in rows on tall branches, sallying out in twos or threes after insects, which are captured on the wing, or soaring for some time in the air and then returning to their perch. The breeding season is from February till about April. The nest is a shallow saucer of grass and roots loosely put together and placed generally at the junction of a palm frond with the stem, but at times in hollow trees, or on the surface of a large horizontal branch. There are usually three eggs, rather narrow ovals, slightly pointed at one end. The ground colour is creamy-white, marked with rusty-brown. Average size ·94 by ·68.

Family ORIOLIDÆ.

Genus *Oriolus*.

Orioles.

With the Orioles we come to a group of families in which the young are streaked. Only one genus is found in India, and only one species is at all common in Ceylon, a second having occurred only as a rare straggler. In our Ceylon forms the adults are easily recognized by their rich yellow and black plumage. The young pass through several stages from the nestling phase, in which the upper feathers are greenish, tipped with yellow, and the lower parts white, streaked with brown, to the full adult dress.

The bill is about the same length as the head, the upper mandible is slightly curved, with the tip notched and hooked, the nostrils are horizontal slits, which stand clear of the feathers at the base of the bill, the rictal bristles are well pronounced. The wings are rather long and pointed, the first

primary is more than half the length of the second. The tail is of medium length and slightly rounded, the tarsus is short, but fairly stout, and is covered in front by transverse scales. Orioles are arboreal in their habits, and feed on fruits and berries. Their notes are rich and flute-like.

Key to Ceylon Oriolidæ.

A.—Crown of head rich yellow.

Oriolus indicus indicus (Black-naped Oriole).

B.—Entire head, throat, and upper breast black.

Oriolus luteolus luteolus (Indian Black-headed Oriole).

ORIOLOUS INDICUS INDICUS.

The Black-naped Oriole.

Oriolus indicus (Oates, Vol. I., p. 502); *Oriolus diffusus* (Legge, p. 355).

Description.—Male: Lores, a band through the eye and the nape black; remainder of body plumage bright yellow; wing coverts bright yellow, the inner webs of the greater coverts and the whole of the primary coverts, except the tips, black; primaries black with yellowish-white tips and margins, the secondaries with wider margins, and the innermost quills almost wholly yellow; tail feathers black with yellow tips, which increase in width on the outer feathers.

In females the yellow of the back is tinged with green.

Bill pinky red; iris rich blood red; legs and feet lead colour.

Length 9·75; wing 6; tail 4; tarsus 1; bill from gape 1·4.

Distribution.—Layard notes two specimens shot in Colombo, the only Ceylon record. The species appears to be a migrant found in winter over a considerable part of the Indian Peninsula but nowhere common.

In Burma it is fairly abundant in Southern Pegu. The summer quarters are in China and Mongolia.

Habits.—Not much is on record concerning these, but it appears to be a forest bird, and less partial to cultivated districts than the next species.

ORIOLOUS LUTEOLUS LUTEOLUS.

The Indian Black-headed Oriole.

Oriolus melanocephalus (Oates, p. 506 ; Legge, p. 357).

Description.—Male : Head, chin, throat, and fore-neck jet black ; remainder of body plumage rich yellow ; winglet black ; primary coverts black with yellow tips ; wing quills black, the primaries with narrow yellowish tips and margins, which are almost invisible on the first few quills ; secondaries with broad diagonal tips of brighter yellow, which increase on the innermost quills ; tail yellow, with a broad patch of black on the four central feathers and a smaller black area on the third pair.

In females the yellow of the back and breast is less bright and generally tinged with green.

In nestlings the feathers of the upper plumage are greenish with yellow tips, the lower plumage is white streaked with brown. As soon as the young are fully fledged, the yellow tips on the upper plumage disappear, the streaks on the lower plumage turn black, and the whole plumage becomes more yellow. The adult dress is assumed gradually from this stage.

Bill black in quite young birds, gradually changing to pink in the adult ; iris brown in the young, crimson in adults ; legs and feet dusky-bluish.

Length 9·5 ; wing 5 ; tail 3·2 ; tarsus 1 ; bill from gape 1·25.

Distribution.—This Oriole is found over the whole of India, except the north-west ; also in Burma, Ceylon, and the Andamans. The present sub-species, from South India and Ceylon, is distinguished by its smaller size, and the less amount of yellow on the wing. It is found all over the Island, wherever there are trees, either in gardens or forest, up to about 6,000 feet and occasionally higher.

Habits.—It is by no means shy, and may be seen close to human habitations. The breeding season extends throughout the north-east monsoon, from October to May. The nest is a deepish cup of grass and strips of bark, suspended by the rim from a horizontal fork at the extremity of a leafy branch. The eggs are two in number, very rarely three. They are

pointed ovals of a pinkish-white or pale cream colour, and sparingly marked with spots of dark reddish-brown, occasionally almost black. Average size 1·10 by ·79.

Family EULABETIDÆ.

Genus **Eulabes.**

Grackles.

The Grackles, or Hill Mynahs, comprise two Ceylon species, which in many respects resemble large Mynahs. They differ, however, sufficiently to justify their separation into another family, the chief outwardly distinctive feature being the fleshy yellow wattles on the nape. Both Ceylon species have a brilliantly glossy black plumage with a patch of white on the wing. The bill is stout and somewhat curved, the oval nostrils are rather sunken and lie just clear of the feathers at the base of the bill. Rictal bristles are present, but are not very pronounced. The first primary is minute and the wings are long, but rather blunt; the tail is short and nearly square, the tarsi are stout and the feet strong. The call is a melodious whistle, and the birds can be taught to speak or to whistle a few bars of a tune. They are strictly arboreal and feed on fruit.

Key to Ceylon Eulabetidæ.

A.—A patch of bare skin under the eye; base of lappets prolonged forward into a V-shaped ridge.

Eulabes religiosa religiosa (Southern Grackle).

B.—No bare skin under the eye; base of lappets not prolonged forward.

Eulabes ptilogenys (Ceylon Grackle).

EULABES RELIGIOSA RELIGIOSA.

The Southern Grackle.

Eulabes religiosa (Oates, Vol. I., p. 510; Legge, p. 682).

Description.—Whole plumage rich black, glossed with purple on the head, cheeks, and hind-neck, and with greenish on the rest of upper parts and throat; the feathers of the

wing coverts and lower parts are glossed on the margins with green, and those of the side of the breast with bronze and purple ; a patch of white on the first eight primary quills.

The wattling consists of a stripe of bare yellow skin running backwards from the eye to the side of the nape, where it coalesces with a similar stripe from the side of the crown to form a broad lappet ; there is also a square, naked patch just under the eye.

In young birds the lappets are only slightly developed and the plumage is more or less devoid of gloss.

Bill orange-yellow ; iris brown, the outer edge white with darker mottlings ; legs and feet lemon-yellow.

Length about 9·75 ; wing 5·7 ; tail 2·8 ; tarsus 1·2 ; bill from gape 1·4.

Distribution.—Found rather locally through the wet and medium zones up to about 1,500 feet. It occurs in the hilly and well-wooded portions of South India.

Habits.—This species is found in well-wooded country, on the borders of open spaces, round tanks, by river banks, &c., but is absent from the heart of heavy forest. It is rather capricious in its distribution, and seldom wanders from its usual haunts. The cry is a shrill whistle, higher and more metallic than that of the next species. It is generally seen in pairs or small parties in the tops of tall trees, where it feeds on fruit and berries. The breeding season appears to be from June till about August. The nest is placed in a natural cavity in a tree, or in the old nest hole of a Barbet or Woodpecker. The bottom is scantily lined with a few dead leaves, &c. The two eggs are of light greenish-blue blotched with purple and chocolate brown. . Average size (of South Indian eggs) 1·3 by ·88.

EULABES PTILOGENYS.

The Ceylon Grackle.

Eulabes ptilogenys (Oates, Vol. I, p. 513 ; Legge, p. 685).

Description.—Whole plumage black, glossed mainly with purple ; a patch of white at the base of the first six or seven

primaries. The wattling is confined to two lappets of rich yellow skin, which spring from the sides of the nape. In old birds these lappets meet at the base.

Bill orange-red, the lower mandible for half its length and the upper mandible from the gape to the nostrils black; iris in males grayish-white mottled with brown, in females white or yellowish-white; legs and feet gamboge yellow.

Length 10·75; wing 6; tail 2·75; tarsus 1·35; bill from gape 1·4.

Distribution.—Peculiar to Ceylon. It occurs in the well-wooded parts of the main hill ranges from about 6,500 feet to 1,500 feet. In the forests westward of the Adam's Peak range it appears to descend almost to sea level.

Habits.—Much the same as those of the last species. The call is rather less shrill. The nest and eggs also closely resemble those of the Southern Grackle, and measure about 1·30 by ·98.

Family STURNIDÆ.

Starlings and Mynahs.

The Starlings and Mynahs form a large group, with a marked family resemblance, found over a great portion of the Old World. Some species are migratory, others resident, but nearly all are gregarious. They are not nearly so arboreal as the Grackles, the greater portion of their food being obtained on the ground. The bill is generally moderately stout, only gently curved, or almost straight; but there is a distinct downward bend of the mouth near the gape.

There are no rictal bristles; the nostrils are rather narrow and almost horizontal; they stand clear of the line of the forehead, but the base of the bill is feathered down to their margins. The feathers of the crown and nape are elongated and in some species form a distinct crest. The first primary is minute. The tarsus is stout, and the feet large. Four genera, each represented by a single species, are found in Ceylon, and one genus, *Sturnornis*, is peculiar to the Island. In the migrant genus *Pastor* the wing is long and pointed, the tail short and square; in the other three resident forms the wing is blunt and the tail more rounded.

Key to Ceylon Sturnidæ.

A.—A noticeable long crest in adults ; no nude skin on side of head.

(1) Wings pointed ; throat and breast in adults black.

Pastor roseus (Rose-coloured Starling).

(2) Wings blunt ; lower parts reddish buff.

Temenuchus pagodarum (Brahminy Mynah).

B.—Feathers of crown and nape only moderately elongated ; a patch of bare skin on side of head.

(1) Throat and fore-neck gray with white shaft-streaks ; bare skin confined to a triangle behind the eye.

Sturnornis senex (White-headed Mynah).

(2) Throat and fore-neck black ; a large naked patch behind and beneath the eye.

Acridotheres tristis melanosternus (Common Ceylon Mynah).

PASTOR ROSEUS.

The Rose-coloured Starling.

Pastor roseus (Oates, Vol. I., p. 518 ; Legge, p. 673).

Description.—Summer : Head, neck, throat, upper breast, wings, and tail glossy black ; feathers of the wing-lining black, edged with white ; thighs, a patch on each flank, and the under-tail coverts black, tipped with white ; rest of plumage clear rose colour.

In winter the black feathers of the head, crest, neck, and throat are tipped with buff ; the feathers of the back and breast are rosy at the base and brown at the ends ; while the crest is not nearly so well developed ; at the end of winter the dull margins of the feathers wear off.

Females appear to be slightly paler, as a rule, and with a shorter crest.

In nestling birds the whole plumage is sandy-brown, the feathers of the crown have darker centres, and there is no crest ; the lower plumage is paler ; the foreneck is streaked with brown ; the wing and tail quills are dark brown, edged

with pale buff; after the first autumn moult the wings and tail become black, a patch of black appears on the upper breast, and the rosy tinge begins to appear on the back, breast, and abdomen; the full adult plumage does not appear to be assumed until the end of the second autumn.

Bill pinkish flesh-colour, the ridge brown; iris brown; legs and feet yellowish-brown.

Dimensions rather variable: length about 9; wing 5·2; tail 3; tarsus 1·25; bill from gape 1·15.

Distribution.—A rather uncertain migrant. It appears to breed in the Balkan Peninsula, in Western Asia from Turkestan to Asia Minor, migrating rather irregularly over a great part of Europe and Asia as far east and south as India and Ceylon.

Habits.—Occasionally a large flock visits the west and north of the Island; one such flock came to Puttalam for some weeks at the end of 1917. During their stay they frequent open grassy spaces and fields, feeding on grass seeds, grain, and insects. The whole flock roosts together in trees. The birds are generally extremely wary and difficult to approach.

TEMENUCHUS PAGODARUM.

The Brahminy Mynah.

Temenuchus pagodarum (Oates. Vol. I., p. 333): *Sturnia pagodarum* (Legge, p. 677).

Description.—Forehead, crown, and the long crest on the nape glossy black, face, neck all round, and lower parts down to the abdomen reddish-buff, the feathers of the neck, throat, and breast elongated and with paler centres; upper plumage from the neck, wing coverts, and inner wing quills brownish-gray; primary quills rusty-black; tail brown with broad white tips, except the middle pair of feathers, which are dove gray shaded with brown; vent, thighs, and under tail coverts pearly-white.

Young birds have no crest, the cap of the head is dark brown. upper plumage ashy-brown, lower parts pale buff with a grayish tinge. The adult plumage is gradually assumed.

Bill bluish at the base, remainder yellow ; iris pale topaz yellow ; legs and feet pale yellow.

Length 8·25 ; wing 4·15 ; tail 2·75 ; tarsus 1·15 ; bill from gape 1·05.

Distribution.—Found only in the dry parts of the Island near the coast. It occurs in suitable districts over the whole of India proper.

Habits.—Although in India this species occurs far inland, with us it is never seen far from the sea. It is rather local, though plentiful where it occurs, as it associates in fairly large flocks, which from time to time shift their quarters to a distance of some miles. It is generally met with in scrubby country, or in grassy spaces dotted with bushes. The birds are wary and hard to approach. They feed chiefly on insects, small beetles, &c., but also on seeds and buds. They are said to breed in the north of the Island in July and August. The nest is a flimsy affair of grass and feathers placed in the hole of a tree. The eggs, three to five in number, are pale whitish-blue, and measure about ·97 by ·75.

STURNORNIS SENEX.

The White-headed Mynah.

Sturnornis senex (Oates, Vol. I., p. 534 ; Legge, p. 680).

Description.—Adult : Forehead, front of face, chin, throat, and ear coverts buffy-white ; remainder of upper plumage, including the wings and tail black with a greenish lustre ; the feathers of the nape and neck with white shafts and those of the back faintly tinged with gray ; the white of the upper throat passes into the lavender gray of the remainder of the lower parts, the fore-neck having conspicuous, narrow, white shaft streaks, which are less noticeable on the breast, flank, and abdomen ; vent and lower tail coverts unstreaked, and almost the same shade as the throat.

In young birds the upper plumage has a brownish tinge, the white on the top of the head is confined to the forehead and eyebrow, the lower parts are darker, while the shaft streaks on the breast and abdomen are broader and less streaky.

Bill pale bluish-brown, leaden blue at the base ; iris dull whitish with a narrow brown inner circle ; eye-lid and skin round the eye dull bluish ; legs and feet leaden blue.

Length 8·4 ; wing 4·3 ; tail 3 ; tarsus 1 ; bill from gape 1·1.

Distribution.—Peculiar to Ceylon, and confined almost entirely to the slopes of the Peak range and the Kukul korale in the Ratnapura District.

Habits.—A rare bird. It appears to be entirely arboreal in its habits, and goes about in small flocks feeding on fruits and berries in the tops of trees. It may be looked for in open spaces dotted over with solitary trees and clumps of jungle, or on the edges of forest and by the side of jungle paths. The nest has been found by Mr. F. Lewis in April. The nest hole was in a tree stem, and much resembled that of the Ceylon Grackle—*Eulabes ptilogenys*. It contained two pale blue eggs laid on the bare wood. They are rather pointed at the narrow end, and measure 1·01 by ·79.

ACRIDOTHERES TRISTIS MELANOSTERNUS.

The Common Ceylon Mynah.

Acridotheres melanosternus (Oates, Vol. I., p. 538 ; Legge p. 670).

Description.—Forehead, crown, and elongated feathers of the nape, with the feathered portion of the cheeks and ear coverts, glossy black ; chin, throat, upper hind-neck, and fore-neck less glossy black ; remainder of upper plumage, with wing coverts and secondaries dark vinous brown ; primaries and tail almost black, the tail feathers with white tips which are sometimes abraded, the primaries with white bases ; primary coverts, edge of wing, and wing-lining white, the outer webs of the outermost primary coverts black ; sides of breast and flanks vinous brown ; centre of breast, top of abdomen, and the thighs dull black ; rest of abdomen, vent, and lower tail coverts white.

In young birds the brown of the plumage has a more rufous tinge, there is no crest on the nape, and the abdomen is tinged with rufous.

Bill yellow, the lower mandible blackish at the base ; iris brownish-pink, pinkish-gray, or at times whitish mottled with brown ; naked skin round eye yellow ; legs and feet light yellow.

Dimensions variable : length about 10 ; wing 5·6 ; tail 3·3 ; tarsus 1·6 ; bill from gape 1·35.

Distribution.—The Ceylon form of this bird is now recognized as merely a sub-species of *A. tristis*, which occurs over practically the whole of the Indian Empire. This Mynah is one of the most familiar birds all over the cultivated portions of the Island, and ascends to a considerable elevation in the hills.

Habits.—A gregarious species, going about during the day in small troops, which may be seen in gardens, coconut estates, grassy lands, &c., or perhaps most frequently in attendance on groups of grazing cattle, not only securing the insects stirred up in the grass by the animals as they move along, but also perching on the beast's backs to feed on parasites. At night they roost in colonies. The favourite roosting site is often a clump of reeds or low bushes in a marsh or large tank. In such a spot the birds often congregate at night in hundreds. As Mynahs are easily tamed and can be taught to speak and whistle, they are familiar pets. The breeding season extends from about March to August. The bird generally chooses for its nest an old Woodpecker's hole in the stem of a coconut palm, placing a pad of grass, roots, and fibres at the bottom of the cavity. The eggs usually number three, occasionally four, or even five. They are broad ovals of uniform pale bluish-green, slightly pointed at the smaller end, and measure about 1·16 by ·84.

Family MUSCICAPIDÆ.

Flycatchers.

The Flycatchers are an extensive group of birds, in which, as in the case of the next family, the Thrushes, the plumage of the nestling is normally mottled. They have, however, well-marked family characteristics. The bill is flat and pointed, in most species viewed from above it has the outline of an almost equilateral triangle, the upper mandible is simply

notched, and has a perceptible little hook at the extreme point. The nostrils stand clear of the line of the forehead and are covered by numerous hairs, which spring from the forehead and lie over them horizontally. These hairs are a most characteristic mark of the family, and are distinct from the rictal bristles. The rictal bristles themselves are generally strong and numerous. There are ten primaries and twelve tail feathers. The wing is generally moderate in length and pointed. All species have feebly developed legs and feet, they are incapable of walking, and few of them ever descend to the ground. They are all insectivorous, and catch their food by darting out in short flights from a perch, to which they return. Many of them are migratory. There is one moult a year, in the autumn, and in most species the young change into the adult plumage at the end of the first autumn. There is one notable exception among our Ceylon species, the fully mature plumage of the male, *Terpsiphone paradisi*, being acquired only in the fourth year.

Ten species, belonging to eight genera, occur in Ceylon. They fall into two groups. First we have seven species, including four migrants, in which the tail falls short of the wing in measurement. In all these seven species the bill is not long, and is almost equilaterally triangular in outline; the rictal bristles are, save in *Culicicapa*, only moderately developed; the wing is pointed and the tail square. The differences between the genera are largely based on the type of colouration, and are shown in the key which follows. In the resident forms of the above group the nest is either placed in a hole or ledge, or attached to the side of a rock or tree trunk. We next come to three forms which are resident, or, at all events, mainly so. These are distinguished by their longer tails, which are never square. The bill, though pointed and triangular, is generally longer than in the preceding group; the rictal bristles are long and numerous. In *Terpsiphone* the bill is large and swollen, and the rictal bristles are coarse. All three species build the most beautiful little cup-shaped nests, which are placed either in a slender fork, or glued on to the top of a thin branch. The young of the three species are not noticeably mottled.

Key to Ceylon Muscicapidæ.

I.—Tail shorter than wing.

A.—Fore-neck and breast, either rich chestnut, or ferruginous in adults.

(a) Upper plumage brown; upper tail coverts black; some white on tail.

Siphia hyperythra (Indian Red-breasted Flycatcher)

(b) Upper plumage generally blue; no black on tail coverts or white on tail. Genus *Cyornis*.

(1) Males blue above; chin and throat dusky-blue; females brown above; chin and throat dull rufous, like the breast.

C. rubeculoides rubeculoides (Blue-throated Flycatcher).

(2) Both males and females blue above: in males the chin feathers adjoining the bill black, remainder of chin and throat same colour as fore-neck; in females the dark chin-stripe is lacking.

C. rubeculoides tickelli (Tickell's Blue Flycatcher).

B.—Sexes alike; greater part of both upper and lower plumage ashy-gray tinged with blue.

Stoparola melanops sordida (Dusky-blue Flycatcher).

C.—Sexes alike; upper plumage plain brown, or rufous; lower parts white or inconspicuously coloured. Genus *Alseonax*.

(1) Upper plumage and tail ashy-brown.

A. latirostris (Brown Flycatcher).

(2) Upper plumage more ruddy brown; rump and upper tail coverts bright rufous brown.

A. muttui (Layard's Flycatcher).

D.—Plumage gray in front, yellow behind.

Culicicapa ceylonensis (Gray-headed Flycatcher).

II.—Tail as long as or longer than wing.

- (a) Tail in males very elongated ; a marked crest ; head glossy black, rest of upper plumage chestnut, except in old males, when it is mainly white.

Tersiphone paradisi paradisi (Indian Paradise Flycatcher).

- (b) No crest.

- (1) Tail same length as wing ; plumage mainly azure blue.

Hypothymis azurea ceylonensis (Indian Black-naped Flycatcher).

- (2) Tail longer than wing and fan-shaped ; upper plumage mainly brown ; a broad band above the eye and most of lower parts white.

Rhipidura albifrontata. (White-browed Fantailed Flycatcher).

SIPHIA HYPERYTHRA.

The Indian Red-breasted Flycatcher.

Siphia hyperythra (Oates, Vol. II., p. 10) ; *Muscicapa hyperythra* (Legge, p. 428).

Description.—Male : Whole upper plumage to the rump dark ashy-brown ; wing coverts and quills dark brown edged with the hue of the back ; upper tail coverts and four central tail feathers wholly black, remaining tail feathers white for two-thirds of their length, on the outermost feather the outer web is black for over half its length ; lores, cheeks, and sides of neck ashen ; chin, throat, breast, and sides of abdomen rich chestnut bordered by a bold black stripe from the gape down to the sides of the breast ; rest of lower surface white, tinged with rufous on the flanks and under tail coverts.

Female : Upper surface with a more earthy tint ; the black of the tail less pronounced ; lores and round the eye grayish ; the chin, throat, and breast are duller, and lack the dividing black border.

Young birds are brownish, streaked and mottled with fulvous; the lower parts are grayish in front, whitish behind, the chestnut tint appears in dull mottled patches which spread and brighten, at the same time in males the black border begins to appear.

Bill brown above, paler near the forehead, the lower mandible and gape fleshy-yellow, the tip dusky; iris hazel brown; legs and feet deep brown.

Length about 4·8; wing 2·75; tail 2; tarsus ·75; bill from gape ·6.

Distribution.—A north-east monsoon migrant, found in the central Hill ranges over about 2,500 feet. The species breeds in Kashmir, and winters apparently only in Ceylon. It has been observed on migration in October in the Deccan, so would seem to migrate down the centre of the Indian Peninsula.

Habits.—Generally frequents the edges of forest, trees by the side of jungle paths, the strips of wood which line the streams in patana country, &c. It is irregular in its visits, being plentiful in certain localities one year and absent the next. The note according to Legge is a monosyllabic whistle, followed by a sharpe little trill, recalling somewhat the note of the Wheatear. It is restless and active in its movements, and is generally found solitary.

CYORNIS RUBECULOIDES RUBECULOIDES.

The Blue-throated Flycatcher.

Cyornis rubeculoides (Oates, Vol. II., p. 23); *Siphia rubeculoides* (Legge, p. 424).

Description.—Male: Closely resembles that of the next sub-species, but is a little smaller and brighter. The distinguishing features are the throat and chin, which are dusky-blue.

Female: Upper plumage brownish-olive with a rusty tinge on the forehead, round the eye, and on the tail-coverts; wings and tail brown with paler margins to the quills; chin, throat, and chest dull rufous; flanks paler; abdomen and lower tail coverts white.

Young birds are brown streaked with fulvous, and with broad fulvous tips on the wing coverts; throat and breast bright fulvous mottled with brown; abdomen white.

Bill black, the gape flesh-coloured; iris brown; legs and feet grayish-blue.

Length 5·7; wing 2·7; tail 2·2; tarsus ·7; bill from gape ·7.

Distribution.—This bird is now considered to be a migrant form sub-specifically allied to *Cyornis rubeculoides tickelli*, which is a resident race. It breeds in the Himalayas, and winters over a considerable portion of the plains of India and Burma. In Ceylon it has been obtained by Legge and Layard during the north-east monsoon, but only in the Jaffna peninsula and the northern forest tract.

Habits.—A restless little bird which keeps to the undergrowth and lower branches in high jungle. The call is more varied and longer sustained than that of the following sub-species.

CYORNIS RUBECULOIDES TICKELLI.

Tickell's Blue Flycatcher.

Cyornis tickelli (Oates, Vol. 11., p. 25); *Siphia tickelliae* (Legge, p. 421).

Description.—Male: Forehead and a streak over the eye shining blue; upper plumage dull blue; wings dull brown, the outer webs of most quills washed with blue; tail feathers blue, the shafts and the greater part of the webs brown; lores, face, and chin feathers adjoining the bill almost black; remainder of chin, throat, and neck bright ferruginous; breast and flanks paler; abdomen and under tail coverts white.

Female: Resembles the male, but the upper plumage is lighter and has a faded appearance; lores whitish; cheeks bluish; no dark chin stripe; chin, throat, and breast paler ferruginous than in the male.

Young birds are streaked with fulvous, and resemble the young of the last sub-species.

Bill blackish ; iris brown ; legs and feet bluish-brown or bluish-gray.

Length 5·8 ; wing 2·8 ; tail 2·45 ; tarsus ·7 ; bill from gape ·75.

Distribution.—A resident form found over the greater part of the peninsula of India and portions of Burma. It is widely distributed over the whole of the Island up to about 4,000 feet wherever there is forest.

Habits.—Keeps to the undergrowth and lower branches in tall forest, and may occasionally be seen in untidy village gardens where there are jak trees. It is very active towards dusk. The call is a little whistling chirrup. I have taken eggs as early as February and as late as June. The nest is rather a deep little cup of dead leaves, moss and grass, lined with finer materials, and placed in holes in banks or trees. Three is the usual number of eggs. They are so thickly speckled as to seem almost uniform olive-brown, the colouring being often deeper at the larger end, owing to the greater density there of the markings. Average size ·77 by ·57..

STOPAROLA MELANOPS SORDIDA.

The Dusky-blue Flycatcher.

Stoparola sordida (Oates, Vol. II., p. 29 ; Leggc, p. 419).

Description.—Head and body plumage in general dull ashy-gray tinged with blue, which is brightest on the crown ; forehead, an indefinite streak over the eye, and the chin washed with bright cobalt blue ; lores and the point of the chin black ; abdomen, vent, and under tail coverts whitish ; wing and tail quills dark brown edged with the hue of the back.

Young birds are dark brown above, each feather with a tawny centre and a blackish border ; feathers of lower plumage grayish with dark borders. The change into adult plumage is gradual.

Bill black ; iris red brown or brown ; legs and feet dark lead colour.

Length about 6 ; wing 3 ; tail 2·4 ; tarsus ·75 ; bill from gape ·7.

Distribution.—The form found in Ceylon was for long supposed to be confined to this Island, but recently it has been discovered as not uncommon in the Travancore hills. It is a sub-species of *S. melanops*, which occurs over the greater part of the Indian Empire. Our bird is fairly abundant up-country at elevations over 2,000 feet, but chiefly in the higher hills.

Habits.—Rather a quiet shy bird, seen chiefly on the borders of hill streams in the jungle, by woodland paths, or on the outskirts of forest. It has a low clear song. It generally perches on logs, rocks, or on branches fairly close to the ground. The breeding season is from March to May. The nest is placed in the crevices of trees or on ledges in the banks of streams or of path cuttings. It is a deepish cup of moss, the outside wall being built up from the ledge on which it rests, and is lined with a few fine vegetable fibres. Two or occasionally three eggs are laid. The ground colour is dull white with minute red spots, which generally form a cloudy zone or cap at the larger end, leaving the rest of the egg scantily marked. Average size of a small series .87 by .58.

ALSEONAX LATIROSTRIS.

The Brown Flycatcher.

Alseonax latirostris (Oates, Vol. II., p. 35; Legge, p. 415).

Description.—Upper plumage ashy-brown, the feathers of the crown with slightly darker centres; a faint tinge of gray towards the rump; lores and a thin ring round the eye whitish; wing coverts and quills dark brown with ashy-white margins to the coverts and inner quills; tail dark brown, the outer feathers with narrow whitish edges; under parts white, the flanks, breast, and fore-neck tinged with ashy-gray.

In young birds the crown is blackish with fulvous streaks; the upper plumage and wing feathers have large fulvous spots; the lower plumage is mottled with brown. After their first moult young birds are more rufous than adults.

Bill black above, the lower mandible yellow with a darker tip; iris brown; legs and feet black.

Length 5.2; wing 2.8; tail 2.1; tarsus .5; bill from gape .65.

Distribution.—A migrant to Ceylon, found during the north-east monsoon over the low-country, but nowhere abundant. It does not appear to ascend the hills to a height of over 3,500 feet. The species ranges from Japan and Siberia in the north to India, Java, and the Philippines. It breeds mainly in the north of its range and on the Himalayas, but some birds appear to be resident in other parts of India, and a few loiter in Ceylon, as it has been obtained in the Island in June.

Habits.—A solitary, quiet, but tame bird, which frequently escapes notice. It generally keeps to the boughs of shady trees either in the forest or even in gardens in the middle of habitations and close to frequented paths. It sits motionless for long periods, darting out at times from its perch to catch insects.

ALSEONAX MUTTUI.

Layard's Flycatcher.

Alseonax muttui (Oates, Vol. II., p. 36; Legge, p. 417).

Description.—Head and nape olive-brown, shading through the rufous-brown of the back into bright rufous-brown on the rump and upper tail coverts; wing coverts and quills brown, edged with the hue of the rump; tail brown, the outer webs washed with rufous; lores and a conspicuous ring round the eye white; ear coverts olive-brown; chin and throat white; cheeks, sides of neck, breast, and flanks yellowish-brown; abdomen and under tail coverts white.

Bill dark brown above, pale horny yellow beneath; iris hazel brown; legs and feet pale yellow.

Length 5·4; wing 2·8; tail 2·1; tarsus ·55; bill from gape ·7.

Distribution.—This species apparently breeds in Sikkim and other parts of the Himalayas. It winters in Travancore and Ceylon, and seems to migrate down the centre of the peninsula, as it has been obtained in October in the Deccan, while on passage. As with the last species, some birds appear to loiter, for the first specimen recorded was obtained by

Layard at Point Pedro in June. It is an extremely rare bird, as yet noted only from the Jaffna peninsula, Trincomalee, and the Western Province.

Habits.—Not much is known about these, but they are probably much the same as those of the last species. It appears, however, to keep to the lower branches of trees by the sides of paths and small glades in the forest.

Note.—*Ochromela nigrorufa*—The Black-and-Orange Flycatcher—is said to have occurred in Ceylon, but the evidence is doubtful. Layard identified a drawing of a bird obtained in June at Ratnapura by Mr. Mitford as being this species, which occurs on the hill ranges of South India in dense woods. The plumage is striking and unusual. In males the forehead, crown, nape, hind-neck, sides of head, and wings are black; the rest is rich orange, slightly paler on the abdomen; some of the wing coverts and inner quills have narrow orange tips. In females the black of the head is replaced by greenish-brown; the wings are dark brown and the orange parts are paler.

Length about 5; wing 2; tail 2·5; tarsus ·8; bill from gape ·6.

CULICICAPA CEYLONENSIS.

The Gray-headed Flycatcher.

Culicicapa ceylonensis (Oates, Vol. II., p. 38; Legge, p. 410).

Description.—Head, cheeks, and hind-neck dark ashy-gray, the feathers of the crown with darker brown centres; back greenish-yellow, the colour brightening on the rump and upper tail coverts; wing coverts and quills dark brown edged on the outer webs with the hue of the rump; tail dark brown, the outer webs of all but the two central feathers edged with the hue of the rump; throat, neck, and sides of breast pale ashy-gray; rest of lower parts bright yellow; wing-lining pale yellow.

Bill brown above, pale horny-yellow beneath; iris brown; legs and feet yellowish-brown.

Length about 5; wing 2·5; tail 2·1; tarsus ·55; bill from gape ·55.

Distribution.—In Ceylon a hill species which rarely descends below 1,000 feet. Above this elevation it is resident and in many localities common. It occurs over practically the whole of the Indian Empire, except in the north-west, being a permanent resident in the hills and a winter visitor to the plains. The range extends to Java and Borneo.

Habits.—A familiar species in most of the up-country forests and jungles. It frequents the lower branches of trees, especially by roadsides, streams, the edges of clearings, &c. It is generally found in pairs and flits about actively, hawking for insects. The whistle is compared by Legge to the syllables "tit-titu-wheee." The breeding season is probably about April and May. The nest is a little pocket of moss fixed to the trunk of a tree or against a rock; at times there is a lining of fine stalks or fibres, but frequently it is unlined. In India there are four eggs, but probably only three in Ceylon. They are dingy yellowish-white, finely speckled with brown and gray, chiefly in a zone towards the larger end. Average size .61 by .48.

TERPSIPHONE PARADISI PARADISI.

The Indian Paradise Flycatcher.

Terpsiphone paradisi (Oates, Vol. II., p. 45; Legge, p. 404).

Description.—Females and young males: Forehead, crown, crest, and nape glossy blue-black; cheeks, chin, throat, and all round the neck ashy-brown; on the fore-neck this colour gradually changes through the pale ash colour of the breast into white on the abdomen, vent, and lower tail coverts; upper plumage from the neck downwards, including wings and tail, chestnut; the inner webs of the wing quills duller brown; the tail is about 4.5 inches long.

The female continues in this plumage all her life, and the male until the second summer. He then gradually becomes blacker on the chin, throat, and hind-neck. After the second annual moult, the head and neck are hooded in glossy blue-black, which contrasts sharply with the ashy-gray of the fore-neck; the inner webs of the wing-quills are almost

entirely chestnut ; at the same time the two central tail feathers grow to a length of 12 inches or more. After the third moult the breast grows lighter, and the bird gradually changes into the white plumage, the change being not complete until after the fourth moult, when the whole head, neck, and crest are glossy blue-black with a metallic sheen, and the rest of the body plumage white ; the feathers of the back and rump have black shafts ; the wing quills are black with white margins, which increase in width on the inner quills ; the tail is white, with conspicuous black shafts and black borders on the outer webs of all but the central feathers.

Bill and eyelids cobalt blue ; iris dark brown ; legs and feet a rather paler blue than the bill.

Adult males : length 16·5 to 19·5 ; wing 3·75 ; tail 12 to about 15 ; tarsus ·7 ; bill from gape 1·05. Females : length about 9 ; wing 3·55 ; tail 4·5.

Distribution.—This Flycatcher is found over the greater part of India proper, and ranges west and north into Afghanistan and Turkestan. A closely allied form occurs in the East Himalayas and Burma. In Ceylon this species is subject to a good deal of seasonal movement, concerning which we have much to learn. In the north-east monsoon both young and old birds are found all over the low-country, but more abundantly in the drier forest tracts. It is not very common above 2,000 feet, but is occasionally seen at quite high elevations, and such visits are apparently increasing. About March the birds appear to migrate north and east to the drier forest tracts. Here the younger birds pair and breed freely from April to June or even later. Long-tailed red birds are not often observed during the south-west monsoon, and I have only once at this season seen a male in the full black and white plumage. They are either soon killed off, or else migrate to India.

Habits.—A fairly familiar bird, which is generally found in forest, or in shady spots not very far from water. It is by no means averse to the neighbourhood of man, and may often be seen in village gardens. It takes more extended flights after insects than many Flycatchers, and is less fond

of returning time and again to the same perch. The cry is rather a grating little single note. The breeding season is chiefly in April and May, but may occasionally extend as late as August. The nest is a beautifully built little shallow cup of fine grass, fibres, &c., bound together with cobwebs and lined with similar finer materials. I have generally found it placed about 6 feet from the ground in the fork of a downward slanting, thin, bare branch fairly close to the stem of the tree. With us there are generally three, often only two, eggs. The ground colour is pinkish-white, rather sparingly spotted, often in a zone, with brownish-red. Average size $\cdot 79$ by $\cdot 60$.

HYPOTHYMIS AZUREA CEYLONENSIS.

The Indian Black-naped Flycatcher.

Hypothymis azurea (Oates, Vol. II., p. 49); *Hypothymis ceylonensis* (Legge, p. 408).

Description.—Male: Head, neck, back, rump, and upper tail coverts, throat, and chest azure blue, brightest on the head and throat; there is a distinct dividing line across the fore-neck between the two shades; the extreme point of the chin, the feathers adjoining the nostrils, and, in fully adult birds, a patch on the nape black; wing coverts and quills dusky-brown, the coverts washed, and the quills edged with the hue of the back; tail dusky-brown, the central feathers and the outer webs of the others washed with azure blue; abdomen, vent, and lower tail coverts white tinged at times with faint blue.

Females lack the black nape patch; the blue of the plumage is slightly duller and the brown lighter; the breast is ashy-blue, and the abdomen, flanks, and lower tail coverts tinged with gray.

Bill dark blue; iris dark brown; legs and feet bluish lead-colour.

Length 6.1; wing 2.7; tail 2.75; tarsus .6; bill from gape .65.

Distribution.—The form found in Ceylon is a good sub-species, in which the black nape patch is small, and the black bar across the throat wanting. It is fairly abundant in forest and high jungle throughout the low-country and in the lower hills. Allied geographical races are found almost throughout the Indian Empire.

Habits.—A forest species, generally found singly or in pairs in secluded spots, often near water. It keeps largely to the undergrowth or lower branches, and, like the last species, has a harsh little cheep. The nest is a dainty little cup of fine grass, coated with cobwebs, and placed in the fork of a young sapling among the forest undergrowth at no great height from the ground. The outside of the nest is generally an inverted cone in shape. There are two or three eggs, which are miniatures of those of the last species. Average size $\cdot 70$ by $\cdot 52$.

RHIPIDURA ALBIFRONTATA.

The White-browed Fantail Flycatcher.

Rhipidura albifrontata (Oates, Vol. II., p. 52 ; Legge, p. 412).

Description.—Crown, lores, ear coverts, and the feathers round the eye rusty-black ; the forehead and a broad band over the eye to the nape white ; upper plumage and wings ashy-brown ; the wing coverts with white spots on the tips ; tail darker brown, the central feathers unmarked, the next pair with white tips, which increase in length on the outer feathers, the outside pair being almost entirely white ; lower cheeks, chin, and throat rusty-black, each feather edged with white ; lower throat and sides of breast unmarked rusty-black ; rest of lower parts white.

Females are slightly lighter brown ; in young birds the feathers of the back and wing coverts have rufous margins.

Bill, legs, and feet black ; iris brown.

Length 7 ; wing 3 $\cdot$ 15 ; tail 3 $\cdot$ 6 ; tarsus $\cdot$ 75 ; bill from gape $\cdot$ 68.

Distribution.—This species, divided into several geographical races, is found over the greater part of India, except on the west and north-west. The Ceylon form is probably a good sub-species, and has a peculiar distribution confined to the east and south-east of the Island. The western limit

of its main haunts runs from Tangalla to Haputale, then across the Uva hills to the park country on the east of the central range as far north as the glades round Polonnaruwa. It is found all over the Hambantota District, but does not appear to occur near the sea in the Eastern Province. Scattered colonies exist outside these limits in a few localities in the Galle and Matara Districts, also in Pussellawa and other places on the eastern portion of the central ranges. It is strange that a bird which is equally at home on the Uva hills and in the dry hot chenas east of Tangalla has not spread all over the drier districts of the Island.

Habits.—A familiar little bird round Bandarawela, &c., where it is known as the “drunken piper” from its human little whistle, which resembles an attempt at the first line of a tune. It has also a grating little call note, not unlike the “scrit” of the Paradise Flycatcher. It is extremely restless, constantly flitting from perch to perch and flirting its fan-shaped tail. It descends to the ground more frequently than most Flycatchers. The breeding season is from April to June. The nest is an exquisite little cup of fine grass coated with cobwebs and placed on the top of a bough or in a small fork. The two or three eggs are creamy-white, speckled generally in a fairly thick zone round the broad part of the egg, with grayish-brown. Average size .67 by .51.

TURDIDÆ.

The Thrush Family.

The *Turdidæ* as defined by Oates are a large Passerine group, in which the young are normally either mottled, or marked with a scaly pattern. Herein they agree with the Flycatchers; they differ, however, in having longer and more serviceable tarsi, and in lacking the horizontal hairs, which in the Flycatchers spring from the forehead and overlie the nostrils. I have followed E. C. Stuart Baker's classification by including in the family the *Brachypteryginæ*—A sub-family transferred from the place given them by Oates in the *Crateropodidæ*—and also by including the genera *Arrenga* and *Irena* in the sub-family *Turdinæ*, or true Thrushes.

The family includes four sub-families represented in Ceylon : the Chats—*Saxicolinæ*; the Redstarts and Robins—*Ruticillinæ*; the Shortwings and Blue Chats—*Brachypteryginæ*; and the Thrushes—*Turdinæ*. The above sub-families comprise a variety of forms, but the following points are held in common, besides those mentioned above; the edges of both mandibles are smooth, or the upper mandible is simply notched; the wing has ten primaries; the nostrils are clear of the line of the forehead; there is an autumn moult, frequently supplemented by a partial change in spring, caused by the shedding of the margins of the feathers; there are usually twelve, very seldom fourteen, tail feathers. Many of the species are migratory.

The four sub-families may be divided thus:—

Saxicolinæ.—Habits like those of the Flycatchers, but more terrestrial. The insect food is captured by short sallies from a perch.

Ruticillinæ.—Insectivorous; largely terrestrial.

Brachypteryginæ.—Insectivorous; habits terrestrial and skulking.

Turdinæ.—Both terrestrial and arboreal; larger in size than the other sub-families and more gregarious; food partly of insects, partly of berries, &c.

Sub-family *Saxicolinæ*.

Genus *Pratincola*.

Chats.

The Chats are nearly related to the Flycatchers, and have the same habit of making short sallies, in search of insects, from a fixed perch, to which they return. Their prey, however, is generally captured on the ground and not on the wing. They have also a very characteristic manner of raising and depressing their tails and darting out their wings when on their perch. They are most strongly represented in Africa, but are also widely distributed in Europe, Central Asia, and India.

In the genus *Pratincola* the bill is fairly wide at the base and moderately curved ; the rictal bristles are well developed ; the wing is moderate in length and somewhat rounded ; the tail is slightly rounded and shorter than the wing ; the tarsus is smooth and moderate in length. The sexes are dissimilar. Only one species is found in Ceylon. The male is black and white, and may be distinguished from the little Black Robin by its white tail coverts.

PRATINCOLA CAPRATA ATRATA.

The Southern Pied Bush Chat.

Pratincola atrata (Oates, Vol. II., p. 60) ; *Pratincola bicolor* (Legge, p. 430).

Description.—Male : In the breeding season the whole plumage black, except for the tips of the rump feathers, the tail coverts both upper and lower, and a broad band on the wing-coverts, all of which are clear white ; as the season wears on the black feathers become more or less fringed with rufous-brown.

Female : The feathers of the upper plumage, including the wings, dusky-brown with lighter edges, the wing coverts with broader light margins ; rump and upper tail coverts pale rufous ; tail almost black ; chin and throat slightly streaky grayish-brown ; breast, sides, and upper abdomen dull pale brown with dark streaks ; lower abdomen unstreaked ; under tail coverts pale rufous.

Young birds are fulvous brown mottled all over with dusky-brown ; lower breast and abdomen pale fulvous ; in males the white wing patch is assumed at a very early stage.

Bill, legs, and feet black ; iris brown.

Length about 6 ; wing 3 ; tail 2·3 ; tarsus ·9 ; bill from gape ·75.

Distribution.—The Pied Bush Chat is found almost throughout the Indian Empire, and ranges from Persia to Java and the Philippines. The present sub-species occurs in South India and Ceylon, and unlike most southern forms, is distinguished by its larger size and more massive bill. In Ceylon

it is confined to elevations of over about 3,500 feet, and is almost entirely restricted to the Horton Plains, the Nuwara Eliya plateau, Uda Pussellawa, and the Uva hill basin.

Habits.—Fairly common in and round Nuwara Eliya and on the patanas and bare or rocky hillsides within its range. It usually occurs in pairs, and is not at all shy. The main habits are described in my remarks on the sub-family. The male has quite a pretty little warble. The breeding season is from April to June. The nest is a saucer-shaped pad of grass, roots, and fibres placed in a grassy ledge or a hole in a bank. There are probably three to four eggs of bluish-green with brownish-red markings. Average size (of South Indian eggs) $\cdot 77$ by $\cdot 6$.

Sub-family *Ruticillinæ*.

Bluethroats and Robins.

The *Ruticillinæ* connect the Chats with the true Thrushes. They are found mainly in Europe and Asia. Many of them are migratory, but only one migrant species penetrates as far south as Ceylon, and that merely as a rare straggler. Our three resident forms, however, are familiar birds. The members of this sub-family are mainly terrestrial; the tarsi are long; the feet are well adapted for running, and the insects on which they feed are picked up from the ground. Like the Chats, they have the habit of frequently cocking the tail and drooping the wings. In one genus—*Thamnobia*—the tarsus is scutellated in front; in the rest it is smooth. In all Ceylon species the rictal bristles are weak and the bill fairly slender; the wing is moderate in length and rounded, being somewhat sharper in *Cyanecula* than in the other genera; the tail varies greatly in length and shape. The sexes are dissimilar.

Key to Ceylon Ruticillinæ.

I.—No white on the tail, which is shorter than the wing.

- (1) Length about 6; upper plumage mainly brown; tail brown and chestnut.

Cyanecula suecica suecica (Indian Bluethroat).

- (2) Length about 6·3 ; upper plumage black in males, dusky-brown in females ; tail black, lower tail coverts chestnut.

Thamnobia fulicata (Black Robin).

II.—Tail black and white.

- (1) Length about 8 ; tail about 3·5 ; upper tail coverts black.

Copsychus saularis ceylonensis (Magpie Robin).

- (2) Length about 11 ; tail about 6 ; rump and upper tail coverts white.

Cittocincla macrura macrura (Shama Robin).

CYANECULA SUECICA SUECICA.

The Indian Bluethroat.

Cyanecula suecica (Oates, Vol. II., p. 99 ; Legge, p. 443).

Description.—Male : Upper plumage, including wings, brown, the feathers of the head and neck with darker centres ; chin and throat bright blue with a rufous patch in the centre of the throat, the blue area is bordered below by a band of black, and this band by another broader rufous band ; lores black ; a buff stripe from the nostrils over the eye to the ear coverts ; cheeks and ear coverts buff mixed with black ; remainder of lower parts dull white ; central tail feathers brown, the others with the basal half chestnut and the end half blackish-brown.

Females : Whole of lower parts buffish white ; a broad blackish gorget with brown spots across the breast. Immature males resemble females, only gradually assuming the blue and chestnut of full maturity, and birds are seldom met with in the full male plumage. In nestlings the upper parts are blackish streaked with buff, the feathers of the lower parts buff edged with black.

Bill black, the base flesh colour ; iris brown ; legs dusky flesh colour.

Length 5·9 ; wing 2·9 ; tail 2·3 ; tarsus 1·1 ; bill from gape

Distribution.—This species, of which there are several races, is found in summer in the far north from Western Europe to the Pacific Coast of Asia. It winters in warmer climates from North Africa to Southern China. With us it is an extremely rare north-east monsoon visitor. A few specimens were procured by Layard at Ambagamuwa, and Legge believes that he once saw it in the North-Western Province.

Habits.—May be looked for in gardens and open country.

THAMNOBIA FULICATA.

The Black Robin.

Thamnobia fulicata (Oates, Vol. II., p. 115 ; Legge, p. 440).

Description.—Male : Whole body plumage glossy blue-black, except the lower abdomen and lower tail coverts, which are chestnut ; wings and tail a less glossy black ; a white patch on the lesser and median wing coverts ; towards the moulting season the plumage loses some of its gloss and hue.

Female : Feathers of upper plumage dusky-brown with slightly brighter brown edges, most noticeable on the wing coverts ; wing quills rather paler brown ; upper tail coverts and tail black ; lower parts dusky-brown with a slightly grayish tinge, the tips of the abdominal feathers and the lower tail coverts dull chestnut.

Young : Blackish-brown above, the wing coverts and quills with broad rufous edges ; upper tail coverts and tail blackish ; feathers of head and fore-neck tipped with rufescent gray ; lower parts dark brown mottled with rufous ; centre of abdomen and under tail coverts pale chestnut.

Bill, legs, and feet black ; iris brown.

Length 6·3 ; wing 2·85 ; tail 2·5 ; tarsus 1 ; bill from gape ·7.

Distribution.—Abundant all over the low-country, more especially in the drier districts. It ascends the hills up to about 4,000 feet. It also occurs in the southern half of the Indian Peninsula.

Habits.—A very familiar bird, whether in town gardens, near villages, in chenas and low scrub jungle, or round tanks, and fields. It is as active and perky in all its movements, and as fearless of man as its namesake, the

English Robin. The note is a cheerful little chirp. The breeding season begins in March and lasts right on through the dry weather to September. The nest is a little loose structure of moss, hair, roots, or grass, placed in all sorts of cavities, from a hole in a bank, or an empty coconut shell lying on the ground, to any available niche in an outhouse or verandah. There are generally only two eggs, at times three. They vary a good deal, the ground colour ranging from dull white to greenish or brownish-white, thickly spotted with reddish-brown and at times dull purplish-gray. Average size of a large Ceylon series .79 by .59.

COPSYCHUS SAULARIS CEYLONENSIS.

The Magpie Robin.

Copsychus saularis (Oates, Vol. II., p. 116; Legge, p. 433).

Description.—Male: Head, neck, breast, and upper plumage glossy blue-black; abdomen, sides of the body, and lower tail coverts white; wing coverts and quills black with a large white area formed by the lesser and median coverts, the outer webs of the innermost coverts and of the two innermost secondaries; the two central pairs of tail feathers black, the three outer pairs white, the remaining pair white, except for a black border on the inner web and at times a thin black edge on the outer web as well; wing lining white.

Females: The black of the wings, tail, and upper parts is rather rusty, the body feathers glossed with blue; chin, throat, and sides of neck dark gray; the white of the under parts not quite so clear as in the male; forehead, lores, and cheeks slightly mottled with gray.

In young birds the dark parts of the upper plumage are distinctly brown; the wing quills have rufous edges; the lesser coverts are more or less mottled with rufous; the throat and breast grayish-brown mottled with rufous.

Bill black; eyelids lead colour; iris hazel brown; legs and feet dark lead colour.

Length about 8; wing 3.8; tail 3.5; tarsus 1.15; bill from gape 1; females are slightly smaller.

Distribution.—This species is found almost throughout the Indian Empire. The Ceylonese form is given sub-specific

rank. It is common over the whole of the Island up to about 5,500 feet, except in the heart of the damp forests.

Habits.—As familiar and tame a bird as the last species. It is equally abundant in town gardens, village compounds, cultivated lands, scrub-jungle, and open forest. It feeds on the ground on insects, and is active on its feet. It has the habit of cocking its tail perpendicularly at the end of its run. The song is varied and full, and, especially during the breeding season, is poured out for long periods in the early morning and late evening. The breeding season is generally from March to August, but at times in the early part of the north-east monsoon. The nest is rather a rough structure of grass, root fibres, &c., placed in the hole of a tree, in any niche of a wall, or among the cadjans in the roof of an out-house or watch hut. There are usually three eggs, very seldom four. They are rather dumpy and slightly pointed. The ground colour is pale bluish-green, or light green, thickly sprinkled with various shades of sepia brown and occasionally bluish-gray. The markings tend to coalesce at the larger end, but vary considerably in distribution. Average size .92 by .69.

CITTOCINCLA MACRURA MACRURA.

The Shama Robin.

Cittocincla macrura (Oates, Vol. II., p. 118 ; Legge, p. 437).

Description.—Male : Whole head and neck, back, wing coverts, and chest glossy blue-black ; rump and upper tail coverts white ; wing quills and primary coverts rusty-black ; four central tail feathers entirely black, the rest black at the base, white at the end ; abdomen, vent, and under tail coverts chestnut ; thighs white above, black at the knee. In females the black parts are more slaty-brown, and the chestnut of the lower parts pale rufous ; quills and wing coverts with narrow rufous edges.

Young birds vary ; in most the upper plumage is dark brown with some light chestnut spots ; the quills are edged with rufous ; the lower parts rusty-red mottled with brown on the throat and breast.

Bill black ; iris brown ; legs pale flesh colour.

Length about 11 ; wing 3·7 ; tail about 6 ; tarsus 1·1 ; bill from gape ·95.

Distribution.—Found throughout the greater part of the low-country forests, but less common in the west and south-west. It ascends the hills to about 3,500 feet. It occurs in Central and Southern India, the sub-Himalayan region from the Ganges eastward and in Assam and Burma.

Habits.—A shy bird, which spends most of its time in forest undergrowth and bamboo scrub. It feeds on insects, and is generally found in pairs. It is our finest songster ; the notes are lower and richer than those of the Magpie Robin. I have found eggs from February till June. The nest is made of dry leaves, grass, and twigs, and is placed in the hole of a tree or dead stump in the forest. The eggs are, as a rule, slightly smaller and more elongated at the narrow end than those of the Magpie Robin. The ground colour is pale grayish-white, at times with a slight green tinge, thickly and rather streakily freckled all over with umber brown. At times the markings are more pronounced at the larger end. Average size ·89 by ·64.

Sub-family *Brachypteryginæ*.

Genus *Larivora*.

Blue Chats.

In the classification adopted by Oates, the *Brachypteryginæ* formed a sub-family of the *Crateropodidæ*, and, as he remarks, connect them with the *Turdidæ*. I have, however, followed Stuart Baker, in transferring the Ceylon species *Arrenga blight* from this sub-family to the *Turdinæ*, and the sub-family itself, which now contains only one migratory Ceylon species, to its present position in the *Turdidæ*. The young appear to have discarded the normal mottled plumage characteristic of the family, but the affinities seem to be with the Thrushes and not with the Babblers. The Blue Chat in its general colouration is not unlike the Blue Flycatchers of the genus *Cyornis*. It is, however, strictly

terrestrial in its habits, skulking in the undergrowth, and, as might be expected in a ground bird, has a long tarsus, whereas the Flycatchers are arboreal and have a weak, short tarsus.

The bill is short and slender ; the nostrils are thin ovals, and not overhung with hairs ; the rictal bristles are scanty ; the wing is moderate in length and somewhat pointed ; the tail short ; the feet are delicate, the middle toe is much the longest. The sexes are dissimilar.

LARVIVORA BRUNNEA.

The Indian Blue Chat.

Larvivora brunnea (Oates, Vol. I., p. 182 ; Legge, p. 446).

Description.—Male : Upper plumage, wing coverts, and tail dull blue ; lores, cheeks, ear coverts, and a band down the sides of the neck dull black ; a white line over the eye to the nape ; wings dusky-brown, the outer webs bluish ; in some specimens the point of the chin and a narrow line on the cheeks white ; throat, breast, and sides of body bright chestnut paling into white on the abdomen, vent, and lower tail coverts.

Female : Head, upper plumage, and lesser wing coverts dark olive-brown, tinged with russet on the tail coverts ; greater wing coverts and quills brown, tinged with rufous on the outer webs, the coverts also with rufous tips ; tail brown washed with russet ; forehead, lores, and sides of head rufous with brown mottlings ; centre of chin and throat, abdomen, and under tail coverts pure white ; sides of chin and throat and the breast rusty fulvous, each feather with a brown margin ; sides of body unmarked fulvous.

Young birds resemble the adult female.

Bill black above, paler beneath ; iris dark brown ; legs and feet flesh colour.

Length 5·5 ; wing 3 ; tail 2 ; tarsus 1·05 ; bill from gape ·72.

Distribution.—This Chat is with us a north-east monsoon migrant. The flight is weak, and it appears to cross by the

shortest sea-route from South India to the north of the Island in October. It then makes its way to the central hills. Many of our visitors are yearling birds. The species occurs over the greater part of India, being a resident on many of the hill ranges and visiting the plains in winter.

Habits.—A skulking bird, which keeps almost entirely to the undergrowth in forest, appearing for short periods at the edge of the jungle, or by the side of jungle paths, and searching actively on the ground for the insects on which it feeds.

Sub-family *Turdinæ*.

Thrushes.

The true Thrushes are larger and, as a rule, more gregarious than the other sub-families of the *Turdidæ*. Their food is not wholly insectivorous, and berries form a considerable part of their diet. The eight species found in Ceylon are all of fairly stout build and of medium size from 8 to 10½ inches in length. None of them are very familiar, as they are all local in their distribution; most of them are rare, and all, save one or two, are met with only in the hills. Four species are peculiar to this Island, while the others are, with one possible exception, rare migrants. The first six species on the list are structurally much alike, and there has been considerable diversity of opinion in dividing them into genera. The wing is moderate, and generally somewhat pointed; the tail is never of great length, and in *Geocichla* and *Oreocincla* is distinctly short; the rectal bristles are feeble; the tarsus is moderately long, stout, and serviceable. The birds spend a good deal of their time on the ground. There is one moult a year, in the autumn, but in many species there is a partial change of plumage in spring, due to the dropping off of the margins of the feathers. In the young the lower plumage is more or less barred or spotted, and in some species this characteristic is maintained in the adults. As regards the last two species, *Arrenga blighi* and *Irena puella*, I have followed Stuart Baker in transferring them from the *Crateropodidæ* to the *Turdinæ*, although the young are no longer spotted. *Arrenga blighi* is Thrush-like in its general

build and appearance, but the wing is more blunt than in the rest of the sub-family. The nest and eggs also, as far as is known, are Thrush-like. *Irena puella* is more aberrant, and has distinct affinities with the Bulbuls. As in the Bulbuls, there are a few long hairs springing from the nape. The wing is rather pointed; the rectal bristles are well developed, and the bill more arched than in other Thrushes. The tarsus is short, and the habits arboreal. The nest and eggs are of a distinct type, unlike either those of the Thrushes or Bulbuls.

Key to Ceylon Turdinæ.

A.—Only a slight difference between the sexes; plumage almost uniform blackish; lower tail coverts same colour as lower parts.

Merula kinnisi (Ceylon Blackbird).

B.—Sexes unlike; plumage more or less pied; under tail coverts unmixed white. Genus *Geocichla*.

(1) No chestnut in plumage; some white in tail; males: black and white; females: olive-brown and buffy-white and with lower plumage barred, not pied.

G. Wardi (Pied Ground Thrush).

(2) Head and most of lower plumage chestnut; male: back and scapulars bluish-gray; female: back and scapulars greenish-brown with yellowish edges.

G. citrina citrina (Orange-headed Ground Thrush).

C.—Sexes unlike; upper plumage blue or brown suffused with blue; lower tail coverts not white; males: lower parts and tail coverts same hue as rest of plumage; females: lower parts fulvous with sub-terminal black bars, lower tail coverts fulvous barred with black.

Petrophila solitaria pandoo (Western Blue Rock Thrush).

D.—Sexes alike ; lower plumage barred or spotted even in adults. Genus *Oreocincla*.

(1) Bill large and coarse ; upper plumage with darker margins ; lower plumage tawny-buff with black crescent-shaped bars.

Oreocincla imbricata (Ceylon Thrush).

(2) Bill more moderate ; upper body plumage and tail unmarked brown ; lower plumage white with black spots.

O. Spiloptera (Spotted-wing Thrush).

E.—A slight difference in sexes ; plumage mainly dark blue or brown suffused with blue ; a bright blue patch on the " elbow " of the wing.

Arrenga blighi (Bligh's Whistling Thrush).

F.—Sexes markedly different ; tarsus noticeably shorter than in other genera ; plumage pied ; males vivid blue and black ; females brownish-blue and brown.

Irena puella (Fairy Bluebird).

MERULA KINNISI.

The Ceylon Blackbird.

Merula kinnisi (Oates, Vol. II., p. 124) ; *Turdus kinnisi* (Logge, p. 449).

Description.—Male : Upper plumage, including wings and tail, slaty-black, each feather with slightly paler bluish-gray margins, most noticeable on the wings and wing coverts ; lower plumage slightly rusty-black with paler margins, the abdomen tinged with grayish.

Female : Upper body plumage dark bluish-gray, with blackish markings towards the tips ; wing quills and tail slightly browner than in the male ; under parts tinged with earthy-brown ; in some, probably not fully adult specimens, the feathers of the abdomen have light shaft-streaks.

In young birds the head and hind-neck are brownish, and the upper plumage has a distinct bluish gloss ; the lower plumage is dull brown, with buff shaft-streaks and dark tips.

Bill orange-yellow ; iris pale brown ; legs and feet pale yellow ; in young birds the bill and legs are brownish.

Length 9·5; wing 4·4; tail 3·6; tarsus 1·25; bill from gape 1·2.

Distribution.—Peculiar to Ceylon, and confined to the hills above 2,500 or 3,000 feet. Allied species occur on the hill ranges of Southern India.

Habits.—Rather a shy bird, passing most of its time in the jungle undergrowth, or on the edges of cover. It is not uncommon round Nuwara Eliya, and may be seen in the more secluded parts of the gardens in that town, or on up-country estates. Out of the breeding season it often collects in fairly large parties to feed on tree fruits in the jungle. It is a fair songster, and is most vocal in the early mornings and towards sunset. The breeding season is from April to June. The nest is a somewhat massive cup of grass, moss, and roots, strengthened with a few twigs and lined with fine roots. It is usually placed in a low fork of a tree, but may be found on stumps, niches in tree trunks, outhouses, &c. There are generally four eggs. The ground colour is pale green, blotched fairly evenly with reddish-brown and umber, and with some smaller underlying spots of reddish-gray. Average size 1·05 by ·82.

GEOCICHLA WARDI.

The Pied Ground Thrush.

Geocichla wardi (Oates, Vol. II., p. 137); *Turdus wardi* (Legge, p. 453).

Description.—Adult male: Whole head, neck, breast, upper plumage, wings, and tail black; a broad white stripe from the bill over the eye to the nape; wing coverts and quills with more or less conspicuous white tips, except the outer primaries and primary coverts, in which a portion of the outer web is white; rump and upper tail coverts with crescent-shaped white tips; the two outer pairs of tail feathers all white, except for a patch of black on the outer webs, the amount of white decreases on the inner feathers, the central pair being almost wholly black; abdomen, vent, and under tail coverts white; sides of body and axillaries white, each feather with a broad irregular crescent of black; wing-lining black tipped with white.

Females: Head, upper plumage, wings, and tail olive-brown, the wing coverts and inner quills tipped with buff, the outer webs of the primaries with pale brown edges; a few white tips on the rump and upper tail coverts; outer tail feathers with a patch of white on the tip; a buff streak from the bill over the eye to the nape; sides of head and throat mixed buff and dark brown; chin almost unmarked white; upper breast pale buff with broad, dark brown margins; lower breast and flanks white with crescent-shaped blackish bars; centre of abdomen, vent, and lower tail coverts white.

Immature males resemble females, but are of a richer brown above, while the breast feathers are olive-brown with drop-shaped white centres.

Bill yellow, the base of the upper mandible dusky; iris brown; legs and feet pale brownish-yellow.

Dimensions a little variable; length about 8·5; wing 4·5; tail 3·2; tarsus 1; bill from gape 1·15.

Distribution.—Breeds on the Himalayas and appears to winter chiefly in the hill ranges of Southern India and Ceylon. It has been seen on passage in various parts of the Indian Peninsula. In Ceylon it is a north-east monsoon migrant to the hills at elevations of over 2,500 feet. In some localities it appears to be irregular in its visits, in others more constant.

Habits.—A shy bird, which keeps mainly to thick cover on the outskirts of forest, patana woods, &c. It occasionally leaves its shelter, and may be seen on the lawns in up-country gardens. At times it collects in small scattered flocks to feed on fruit, such as guavas and wild figs, being partly frugivorous.

GEOCICHLA CITRINA CITRINA.

The Orange-headed Ground Thrush.

Geocichla citrina (Oates, Vol. II., p. 140; Legge, p. 457).

Description.—Male: Whole head, neck, and lower parts to vent orange-chestnut, darker on the crown, and paler on the lower parts; vent, thighs, and lower tail coverts pure white; feathers of back, scapulars, rump, upper tail coverts, and lesser wing coverts bluish-gray with paler edges; the median wing coverts with broad white tips; outer coverts and quills dark brown with bluish-gray outer webs; the

central tail feathers and the outer webs of the rest bluish-gray, the remainder of the tail dark brown, the whole with indistinct cross-rays; axillaries white with pale gray tips; wing-lining gray tipped with white.

In females the chestnut parts are paler, and the gray of the upper plumage is washed with olive-green; back and scapulars greenish-brown with yellowish margins.

Bill blackish-brown, the gape and base of lower mandible flesh-colour; iris dark brown; legs and feet fleshy-pink.

Length 8.5; wing 4.6; tail 3; tarsus 1.3; bill from gape 1.1.

Distribution.—Breeds throughout a large part of the Himalayas. In winter it occurs sparingly in the plains of India proper, but is more common in Assam and Burma. In Southern Burma it appears to be a partial resident. In Ceylon it is one of our rarest migrants, single specimens having been recorded from the Jaffna and Hambantota Districts and the Eastern Province.

Habits.—May be looked for during the north-east monsoon by river banks, or the sides of paths in heavy forests. It keeps mainly to the ground, turning over dead leaves in damp spots in search of insects.

PETROPHILA SOLITARIA PANDOO.

The Western Blue Rock Thrush.

Petrophila cyanus (Oates, Vol. II., p. 146); *Monticola cyana*; Legge, p. 460).

Description.—Male: In winter the whole body plumage is blue, the colour brightest on the eye-brow, throat, and ear coverts; most of the feathers have narrow whitish fringes and dull brown sub-terminal bars; lores and round the eye blackish; wings and tail dark brown, the quills edged with blue and tipped with white. At the end of winter the feathers nearly all lose their light fringes and dark bars, so that the body plumage is almost uniform blue.

Female: Upper plumage brown suffused with dull blue; lower plumage fulvous with sub-terminal black bars; wing-lining and under tail coverts barred with black. In summer the fringes and bars largely disappear as in the male.

Young birds resemble females, but have broader white fringes.

Bill, legs, and feet black ; iris hazel.

Length about 9·5 ; wing 4·9 ; tail 3·4 ; tarsus 1·2 ; bill from gape 1·2.

Distribution.—The Blue Rock Thrush breeds over a wide range from Southern Europe to China and winters in Northern Africa and Southern Asia. It varies considerably, the present sub-species, which is the Western form, visits almost the whole of the Indian Empire in winter. In Ceylon it is only an occasional visitor, which has been recorded from a few localities in the hills.

Habits.—A shy restless bird, which may be looked for in bare rocky spots, especially under high precipices. Birds which visit us appear to frequent the same locality during the whole of their stay.

OREOCINOLA IMBRICATA.

The Ceylon Thrush.

Oreocincla imbricata (Oates, Vol. II., p. 154 ; Legge, p. 455).

Description.—Head and upper body plumage olive-brown, slightly paler on the rump and upper tail coverts, the feathers with crescent-shaped black tips giving the plumage a scaly appearance ; feathers of the head and neck each with a pale shaft-streak, which adjoining the black tip becomes a tawny patch, this is more noticeable in some specimens than in others ; wings dark brown, the secondary coverts tipped and narrowly edged on the outer web with tawny-buff, the primary coverts black on the inner web and tip, the outer web washed with tawny-buff, the quills more faintly washed on the outer web with the same hue ; tail olive-brown, the three feathers next the outermost on each side blackish with paler tips ; face and lower parts rich tawny-buff, the chin and abdomen paler, each feather with a bold black crescent-shaped tip, these tips become almost obsolete on the chin, centre of abdomen, and lower tail coverts ; axillaries white at the base, black at the tip ; wing-lining black tipped with white.

Bill blackish-brown, paler at base of lower mandible ; iris brown ; legs and feet fleshy-brown, at times with a bluish tinge.

Length about 9·5 ; wing 4·9 ; tail 3 ; tarsus 1·1 ; bill from gape 1·4.

Distribution.—Peculiar to Ceylon and confined to the hills over 3,000 feet. Closely allied species are found on the Nilgiris, Eastern Himalayas, and Burma.

Habits.—An uncommon and shy bird, which may be found in open but secluded spots in wooded country, or in thick scrub. It keeps almost wholly to the ground, turning over fallen leaves for the insects on which it feeds. Nothing is known of the nidification.

OREOCINCLA SPILOPTERA.

The Spotted-wing Thrush.

Oreocincla spiloptera (Oates, Vol. II., p. 155) ; *Turdus spiloptera* (Legge, p. 451).

Description.—Upper plumage and lesser wing coverts rich olive-brown with a tinge of russet ; median and greater wing coverts blackish-brown with a clear white spot on the tip ; wing quills dark brown, the outer webs with paler edges ; tail rusty olive-brown with very faint cross-rays ; lores whitish ; ear coverts and cheeks mixed black and white ; lower parts white, the sides of the breast and body tinged with gray ; the feathers of the fore-neck, breast, and upper half of the abdomen tipped with more or less fan-shaped black spots ; axillaries white tipped with dark brown ; wing-lining dark brown tipped with white.

In birds from the wet zone the upper plumage is darker than in specimens from drier districts.

In nestlings the feathers of the upper plumage have pale shaft-streaks, while the spots on the wing coverts and the ground colour of the lower parts are buff.

Bill blackish, paler near the gape ; iris brown ; eye-lid lead-gray ; legs and feet dusky bluish-gray, or fleshy-gray.

Length about 8·4 ; wing 4 ; tail 3·1 ; tarsus 1·4 ; bill from gape 1·1.

Distribution.—Peculiar to Ceylon. Found in the hills up to about 4,000 feet and in the forests at their base, extending almost to the sea in the west and south-west. In the northern forest tract it is rarer, but has been obtained as far north as Trincomalee.

Habits.—A shy bird, which may be found in damp jungle, bamboo scrub, and forest undergrowth. It spends most of its time on the ground hunting for insects. The male has a pretty whistle, and sings from a perch on a low bough, chiefly in the morning and evening. Both sexes have a weak little note uttered while searching for food. The breeding season extends from January to about May. The nest is placed either in the fork of a sapling a few feet from the ground, or among the roots of a tree growing on a bank or little eminence. It is a loose-looking, though compactly put together structure of small twigs, roots, moss, and grass, lined with finer materials of the same sort, the egg cavity being a deep cup. There are two or three eggs, in shape regular ovals. The ground colour is pale bluish-green, scattered over with markings of light reddish-brown, or light red and reddish-gray. The marks tend to coalesce at the larger end. Average size 1.12 by .75.

ARRENGA BLIGHI.

The Ceylon Whistling Thrush.

Arrenga blighi (Oates, Vol. I., p. 183); *Myiophonus blighi* Legge, p. 463).

Description.—Male: Head and neck dull black; feathers of back, scapulars and breast dark blue with black bases; a patch of bright blue on the least wing coverts and the point of the wing; remainder of wing and the tail brownish-black, the wing quills with narrow bluish edges; rump and upper tail coverts black tinged with chocolate brown; abdomen, vent, and under tail coverts dull brown.

According to Legge, females resemble males, but have a lighter and brighter wing spot.

Immature birds are largely dark brown above, with traces of the blue wing spot, and chocolate brown on the whole of the lower parts, the feathers of the forehead, throat, and breast with lighter centres.

Bill, legs, and feet black ; iris brown.

Length about 8·25 ; wing 4·3 ; tail 3·3 ; tarsus 1·4 ; bill from gape 1·25.

Distribution.—Peculiar to the Island and one of our rarest residents. It is confined to the hill country at elevations of over 3,000 feet.

Habits.—This species keeps to the neighbourhood of mountain streams running through forest-clad gorges. It hides in the shade of the forest, now and again showing itself on the rocks in the stream bed. The cry, according to Legge, is a long-drawn, plaintive, though loud, whistling note. Its diet appears to be mainly insectivorous. Mr. E. Green discovered what he believed to be the nest of this species on March 1.* “ It was placed on a sheltered ledge of rock by the side of a waterfall and hidden by surrounding ferns. It was a very compact, solid structure of moss and fern roots, the top forming a level platform, in which a small and rather deep cavity was sunk for the eggs. The platform exceeded in area the hollow space, and when first found the fresh body of a small fish was lying upon it, its head having apparently just been devoured. In the hollow of the nest was a single egg, bluntly oval, with a smaller and larger extremity ; the colour dull greenish-white stained with pale reddish at the end. I was unable to get a sight of the birds, though I heard them in the bushes close by, uttering the complaining note common to many thrushes. I had on former occasions seen specimens of what I believe to be *M. blighi* frequenting this stream.”

IRENA PUELLA.

The Fairy Bluebird.

Irena puella (Oates, Vol. I., p. 240 ; Legge, p. 466).

Description.—Male : The whole of the upper parts, lesser wing coverts, and under tail coverts glistening ultramarine blue shot with lilac ; sides of head and lower parts deep black ; greater wing coverts, wing quills, and tail black ; some of the coverts have blue tips and the central tail feathers are washed with blue.

* *Vide* “ Taprobanian,” Part II., Vol. III., 1887, p. 27.

Females : Upper plumage, lesser wing coverts, and lower tail coverts brownish-blue with brighter edges ; tail brown, the central feathers and outer webs of the others, except the outermost pair, the same blue as the back ; wing coverts and quills dark brown, the greater coverts and innermost quills tinged with blue on the outer webs ; sides of head and lower plumage brownish-blue.

Immature birds resemble females, the change into adult male plumage is gradual.

Bill, legs, and feet black, iris crimson.

Length 10·5 ; wing 5 ; tail 4 ; tarsus ·80 ; bill from gape 1·15.

Distribution.—Very rare and probably a casual visitor. It has been obtained near Kandy and in the Ratnapura District. In India it occurs on the Malabar Coast, on the lower slopes of the Eastern Himalayas, the Assam hills, Burma, the Andamans, and Nicobars.

Habits.—May be looked for in tall forest. It feeds entirely on fruit, and is generally found in small parties or pairs on the top of the higher trees. In India the breeding season is from February to April. The nest is a shallow cup of moss or twigs placed in a sapling or small tree. Two eggs are laid. The colour is pale green, streaked and blotched with pale, dull or reddish-brown. Average size (of Indian eggs) 1·14 by ·77.

Family *Ploceidæ*.

Weaver Birds and Munias.

With the *Ploceidæ* we come to the first of two families in which the bill is strong and conical, while the nostrils are pierced within, or only just outside the line of the forehead, and lie closer to the ridge than to the cutting edge of the bill. There is never more than the trace of a notch in the upper mandible. The primaries are ten in number, but the first is quite small. Africa is the strong-hold of the family, but it is also well represented in South-Eastern Asia and Australia. There are two sub-family groups.

(a) *Ploceinæ*, or Weaver Birds, in which the first primary, though small, is quite easily seen, and which have a partial spring moult as well as the usual moult in autumn.

(b) *Viduinæ*, or *Munias*, in which the first primary is exceedingly small, and which have no spring moult,

Sub-family *Ploceinæ*.Genus *Ploceus*.*Weaver Birds.*

The Weaver Birds comprise two Ceylon species of about the size of the Sparrow, to which in build they bear a considerable resemblance. They feed largely on grain and are very gregarious. They always breed in colonies and take their name from the neatly woven flask-shaped nests which they construct.

In addition to the autumn moult, there is a partial moult in spring, after which the males assume a bright yellow crown. The bill is stout and conical ; the wings are of moderate length and rather rounded, the first primary though small is plainly visible and reaches just beyond the primary coverts ; the tail of 12 feathers is short and rounded ; the tarsus is strong, but of moderate length, the claws are fairly long and curved.

Key to Ceylon Ploceinæ.

1.—Breast plain or not conspicuously streaked.

Ploceus passerinus baya (Common Weaver Bird).

2.—Breast conspicuously streaked.

P. manyar manyar (Striated Weaver Bird).

PLOCEUS PASSERINUS BAYA.

The Common Weaver Bird.

Ploceus baya (Oates, Vol. II., p. 175) ; *Ploceus philippinus* (Legge, p. 641).

Description.—Male in breeding plumage : Forehead, crown, and nape canary-yellow, blending on the nape into the dark brown of the hind-neck ; feathers of the back and scapulars almost black with broad yellow margins ; lower back and rump unstreaked brown ; upper tail coverts with pale tips ; wing coverts, quills, and tail feathers dark brown with pale fulvous edges ; lores, face, ear coverts, and throat dark brown ; breast bright yellow ; rest of lower parts fulvous, paling into whitish on the vent and lower tail coverts.

Males in off season and females all the year round: The yellow is absent, the upper plumage being dark brown with fulvous margins; a fulvous streak over the eye; sides of head pale fulvous brown; lower parts pale fulvous, darker on the breast and flanks, and almost white on the abdomen, vent, and lower tail coverts; the sides of the breast and the flanks at times have narrow brown streaks; wings and tail as in breeding male.

Bill, of male in breeding season, dark horny-brown, lighter at the gape and base of the lower mandible, otherwise yellowish horn-colour; iris brown; legs and feet flesh-colour.

Length 5·85; wing 2·85; tail 1·9; tarsus ·8; bill from gape ·65.

Distribution.—*P. passerinus* occurs over the whole of the Indian Empire, and ranges south-east to Java and Sumatra. The present sub-species is found over the greater part of India proper. In Ceylon it is met with throughout the low-country, but is perhaps commoner in the maritime districts than inland. It is local and occasionally shifts its quarters.

Habits.—Occurs in flocks on the borders of open land and scrub jungle, generally not far from water, and frequently by the side of a paddy field or tank. The presence of a flock can always be told by the incessant chattering and shrill whistling made by the birds. They have a strong rapid flight and feed voraciously on paddy and other grain. The breeding season appears to be intermittent, and extends over a great part of the year, probably varying in different localities. I have taken eggs in February, June, August, and November. The birds breed in colonies, the long flask-like nest, familiar to most people, being hung from the fronds of a palm or the spreading branches of a tree. The construction shows great skill. The upper part of the nest is cone-shaped and hangs from a single point. When this cone is woven to a sufficient length, the birds add a strong transverse loop, like an inverted basket handle, a little to one side of the centre. The bottom of the egg chamber is then worked in on one side of the loop, while on the other the weaving is carried downwards to form the long entrance funnel, which

is added to by the male long after the hen has begun to sit. There are generally two, but not infrequently three, and very occasionally four eggs. They are pure white ovals slightly pointed at the small end. Average size $\cdot 79$ by $\cdot 57$.

PLOCEUS MANYAR MANYAR.

The Striated Weaver Bird.

Ploceus manyar (Oates, Vol. II., p. 179 ; Legge, p. 646).

Description.—Male in breeding plumage. Top of head rich yellow ; remainder of upper plumage, including wings and tail, deep blackish-brown, with tawny margins to the feathers ; cheeks, ear coverts, sides of neck, and throat brownish-black ; chest and flanks tawny-brown with blackish shaft-stripes, which are broadest on the chest ; centre of abdomen, vent, and under tail coverts whitish. Both the amount of striation and the depth of colour on the lower parts vary.

Males in off season and females at all times. Plumage of head and upper parts blackish-brown with tawny edges ; a light stripe over the eye ; the lower part of the cheeks and throat yellowish-white ; breast and flanks striated as in the breeding male.

Bill, in breeding males, bluish-black, paler at the gape, in females and non-breeding males yellowish horn-colour ; iris brown ; legs flesh-colour.

Length $5\cdot75$; wing $2\cdot75$; tail $1\cdot8$; tarsus $\cdot75$; bill from gape $\cdot65$.

Distribution.—The striated Weaver Bird is found throughout the Indian Empire, and extends south-east to Java. It is divided into several sub-species. Its occurrence in Ceylon is distinctly local. It is abundant among the reed beds of the tanks and swamps of the Tangalla district, and I have found colonies in similar reed beds at one or two tanks in the Puttalam District. It probably occurs in various other suitable localities in the low-country.

Habits.—In Ceylon this species confines itself to the vicinity of reed beds in swamps and tanks. Like the last species, it

occurs in flocks, which can be heard at some distance. It appears to feed on insects as well as on grass seeds. The breeding season is about February and March, and again in June. The nest is constructed like that of the last species, but the top is almost square, not tapering, being hung from the points of several bulrush leaves gathered together; the funnel, too, is shorter. The eggs resemble those of the Common Weaver Bird, and are two or three in number. Average size $\cdot 76$ by $\cdot 58$.

Sub-family *Viduinæ*.

Munias.

The *Viduinæ* are a fairly numerous group of small finch-like birds, the largest of which seldom exceed 5 inches in length. They differ from the Weaver Birds in having an exceedingly minute first primary, and by not undergoing any change of plumage in spring. They are all more or less gregarious, except in the breeding season, and all build large globular nests of grass, often using fine grass stems with the flower heads still attached. The entrance is generally a round opening at one side of the ball. The eggs are invariably pure white, and the clutches are large, frequently consisting of six eggs or even more. *Munias* feed on grain and small grass seeds. Five species are found wild in Ceylon. One of them belongs to the genus *Munia*, in which the tail is short and round, while the middle pair of feathers are narrow and pointed. The plumage in this genus is mainly black and chestnut. The other species are all included in the genus *Uroloncha*, in which the tail is longer, while the outer feathers are considerably shorter than those in the centre.

None of the *Munias* are known to migrate, but as many species are frequently kept as cage birds, several exotic forms from time to time occur as escapes. Three such species have been recorded in the Island:—

(1) *Munia oryzivora* (The Java Sparrow).—This species has the head black with white cheeks and ear coverts; the rump and tail are also black; the remainder of the upper

parts, with the wings, neck, and breast, are bluish-gray ; the abdomen, sides, and thighs are vinous, and the under tail coverts white.

This is a native of the Malay Peninsula and Archipelago, and is a familiar cage bird. It appears to be acclimatized near Madras, and in Legge's time it seems to have flourished temporarily round Colombo ; it may still be seen, occasionally, on the Galle Face (*vide* Legge, p. 646).

(2) *Munia atricapilla* (The Chestnut-bellied Munia).—This species resembles *M. malacca*, but the lower breast and sides of the body are chestnut, not white. Its natural habitat is in Northern India, Assam, and Burma. Its occurrence has been recorded by Layard at Galle and by Legge in Colombo (*vide* Legge under *M. rubronigra*, p. 652).

(3) *Sporæginthus amandava* (The Indian Red Munia).—This bird belongs to a genus in which the middle tail feathers are broad and rounded, and the plumage of the two sexes differs. In the male the head, neck, breast, and upper parts are crimson ; the rump, upper tail coverts, and part of the lower plumage are spotted with white ; the wings are brown with white spots ; the abdomen, vent, and tail largely black.

In the female the upper plumage and wings are mainly brown ; the rump and upper tail coverts washed with crimson ; the lower plumage is brownish tinged with fulvous yellow on the abdomen.

It occurs all over India, also in Siam, Cochin-China, and parts of Malaya. The only Ceylon records are by Legge (*vide* Legge, p. 662, under *Estrelida amandava*). He found a small flock on the outskirts of Colombo in 1870, and again one or two birds at Galle in 1872. In both cases the occurrence in the vicinity of a large town is suspicious, but the birds may possibly have been storm-driven from India.

Key to Ceylon Viduinæ.

A.—Tail rounded and short ; head black, contrasting with the colour of the back. Genus *Munia*.

(1) Lower breast and sides of body white.

M. malacca (Black-headed Munia).

B.—Tail longer and more pointed ; crown and nape much the same colour as back. Genus *Uroloncha*.

(a) Some white on rump or upper tail coverts.

(1) Rump white ; throat and breast black.

U. striata (White-backed Munia).

(2) Upper tail coverts and whole of lower parts white.

U. malabarica (White-throated Munia).

(b) No white on rump or tail coverts ; lower parts chequered.

(1) Chin and throat blackish ; chequering includes the whole abdomen.

U. kelaarti (Ceylon Munia).

(2) Chin and throat chestnut ; centre of abdomen not chequered.

U. punctulata (Spotted Munia).

MUNIA MALACCA.

The Black-headed Munia.

Munia malacca (Oates, Vol. II., p. 182 ; Legge, p. 652).

Description.—Whole head, neck, upper breast, the middle of the abdomen, vent, thighs, and under tail coverts deep black ; rest of lower plumage white ; back, scapulars, and wing coverts chestnut ; wing quills brown edged with chestnut ; upper tail coverts shining maroon ; tail feathers brown edged with glistening chestnut, which at times approaches the maroon hue of the tail coverts. In young birds the upper plumage, wings, and tail are rufous-brown ; the under plumage pale buff. The adult plumage is acquired gradually by moult.

Bill pale lavender ; iris dark brown ; legs and feet lead blue.

Length 5 ; wing 2·2 ; tail 1·55 ; tarsus ·65 ; bill from gape ·45.

Distribution.—Rather local, and found chiefly in the east and south-east of the Island ; in the low-country frequenting the long grass of swamps, in the hills the long mana grass of the patanas, and further east the grassy glades of the park country. In other parts of the country it appears to be local and scarce. It occurs over the southern half of India.

Habits.—As noted above, this *Munia* is found among long grass. It generally occurs in small parties, or at times larger flocks, and feeds on grass seeds, often doing some damage to crops. The breeding season appears to be from March to August in the low-country, and about May in the hills. The nest is of the usual type described in my remarks on the sub-family. It is generally placed in a tuft of long grass or fern, occasionally in a low bush. There are four to six pure white eggs. The shape is a slightly pointed oval. Average size $\cdot 66$ by $\cdot 46$.

UROLONCHA STRIATA.

The White-backed Munia.

Uroloncha striata (Oates, Vol. II., p. 185); *Munia striata* (Legge, p. 660).

Description.—Forehead and crown blackish with indistinct white shafts; upper plumage, ear coverts, and sides of neck dark brown, deepening on the tail coverts and wing coverts into blackish, each feather with a white shaft; a broad white band across the lower back and rump; wing quills blackish-brown; tail almost black; face, chin, throat, fore-neck, and breast deep black; abdomen and sides of body white; vent, thighs, and under tail coverts blackish.

Young birds are more rufous-brown above and the throat and breast are brown with paler shafts and margins.

Bill, upper mandible blackish; lower bluish; iris reddish-brown; legs and feet bluish lead-colour.

Length 4.5; wing 2; tail 1.75; tarsus .55; bill from gapo .4.

Distribution.—Common over almost all the low-country. It ascends the hills up to about 2,500 feet; on the Uva patanas it is found up to about 4,000 feet. In India it occurs south of a line drawn from about Bombay to South-west Bengal.

Habits.—Not so gregarious as some species. It occurs in small parties, and frequents waste scrubby land, clearings in the jungle, patches of grass in forests, &c. It visits paddy fields when the grain is in ear, and also levies considerable toll on kurakkan chenas. It breeds intermittently, chiefly during

the north-east monsoon, but occasionally as late as August. The nest is a loose ball of grass of the usual type, placed in a bush or the branches of a low tree from 3 to 10 feet from the ground. The situation chosen is generally rather a solitary spot, such as the edge of the forest at the head of a tank, or by a grassy roadside in the jungle. There are 4 to 6 eggs, pure white ovals, occasionally rather pointed. Average size .60 by .43.

UROLONCHA KELAARTI.

The Ceylon Munia.

Uroloncha kelaarti (Oates, Vol. II., p. 187; *Munia kelaarti* (Legge, p. 650).

Description.—Upper plumage chocolate-brown with pale shafts, the crown rather darker; rump and upper tail coverts almost black with white cross-shaped spots, the longer tail coverts with shining yellow tips; wing quills blackish-brown; tail almost black; sides of neck and of breast pinkish-brown; cheeks, lores, chin, throat, and fore-neck brownish-black; lower plumage from breast irregularly chequered white and black.

Young birds are dark brown above; they lack the pale shafts and the white marks on the rump; the whole of the lower parts, including the throat and fore-neck, are mingled brown and pale buff.

Bill blackish, base of lower mandible bluish; iris sepia-brown; legs and feet lead-colour, at times with a greenish tinge.

Length 4.7; wing 2.1; tail 1.7; tarsus .55; bill from gape .45.

Distribution.—Peculiar to Ceylon and confined to the hills, rarely descending as low as 2,000 feet. It is commonest on the central ranges, from the Peak to the Nuwara Eliya plateau.

Habits.—Less gregarious than most Munias, only collecting in flocks to roost. The flight, too, is more rapid. It is found deep in hill forests as well as in gardens or on estates. Like the other species it feeds on seeds, and like the sparrow it will hunt for food on dunghills, rubbish heaps, or roadsides. The

breeding season is from May to December. It frequently places its nest among the bushy creepers growing on the walls and verandahs of up-country bungalows, but it also builds in forest trees or bushes. The nest is of the usual globular type. The four or five eggs are slightly pointed ovals of pure white, and measure about $\cdot 61$ by $\cdot 45$.

UROLONCHA MALABARICA.

The White-throated Munia.

Uroloncha malabarica (Oates, Vol. II., p. 188); *Munia malabarica* (Legge, p. 662).

Description.—Upper plumage, wing coverts, and inner quills pale earth-brown, darker on the crown; primary quills rather darker, the outer webs almost black; upper tail coverts white, the outer webs of the outside coverts black; tail blackish; sides of head and all the lower parts pale buffy-white, the lower flanks with a rusty tinge.

Bill, upper mandible partly black, partly horn-colour, lower mandible black; iris brown; legs and feet mauve or lilac.

Length $4\cdot 75$; wing $2\cdot 1$; tail 2 ; tarsus $\cdot 55$; bill from gape $\cdot 4$.

Distribution.—In Ceylon this *Munia* is found only in the dry maritime districts of the north and south-east. It is, however, widely distributed over the whole of India proper and ranges into Afghanistan.

Habits.—Found in dry sandy pastures round the lagoons of the north and south-east coasts, in dry paddy fields, &c. It goes about in flocks frequently in company with the Finch Lark *P. grisea*. It feeds entirely on the ground, mainly on small grass seeds, but occasionally visits fields of ripening paddy. The breeding season is from December to March. The nest is generally the usual globular mass of grass, with the opening at one side, but at times it is only partially domed, and in some cases the dome is altogether wanting.

The average clutch is probably from four to six eggs, but in India as many as fifteen have been found in one nest, probably the product of several birds. They are rather broad, glossless white ovals. Average size $\cdot 62$ by $\cdot 45$.

UROLONCHA PUNCTULATA.

The Spotted Munia.

Uroloncha punctulata (Oates, Vol. II., p. 189); *Munia punctulata* (Legge, p. 656).

Description.—Upper plumage dull chocolate-brown with paler shafts; rump darker with yellowish bars and white streaks; upper tail coverts glistening yellowish-brown; tail feathers brown edged with the hue of the tail coverts; wing quills chocolate-brown with chestnut edges; sides of head, chin, and throat rich chestnut; lower parts white, all the feathers, except on the centre of the abdomen, with conspicuous wavy edges and cross-bars of blackish-brown; lower tail coverts tawny with, at times, some black marks.

Young birds are uniform rufous-brown above and pale buff below.

Bill bluish-black; iris lightish-red; legs and feet black or lead-colour.

Length 5; wing 2·2; tail 1·75; tarsus ·6; bill from gape ·45.

Distribution.—Our commonest species: abundant all over the low-country and in the hills to about 2,500 feet, or in patana districts to about 4,000 feet. It occurs throughout India, except in the north-west; also in Assam and parts of Burma.

Habits.—A gregarious species occurring in large flocks in paddy fields, grass lands, village gardens, and compounds. It is seldom found far from cultivation, except in patana country. It commits considerable depredations on paddy crops. The birds roost in colonies in low trees and bushes. Breeding appears to be carried on almost throughout the year. The nest is of the usual type and is placed in a low tree, generally a lime or orange tree, or some other thorny species, in an untidy native garden. There are often several nests in the same tree. There are usually four to six white eggs, oval in shape. Average size ·66 by ·45.

Family FRINGILLIDÆ.

Sub-family *Fringillinæ*.*Finches.*

The Finches agree with the Ploceidæ in having a strong conical bill with the nostrils pierced close to the line of the forehead and near the ridge of the bill. The edges of the mandibles are smooth, the rictal bristles are few and short, and there are twelve tail feathers. The chief outward structural point of difference is that there are only nine primaries in the wing, the first being nearly as long as the second. In the sub-family *Fringillinæ* the bill is moderate in size, and the cutting edges of the mandibles are in contact for the whole length of the bill. The wings and tail are moderate in length, the tarsi and feet fairly well developed. There is one yearly moult, in autumn. The two sexes generally differ in their plumage and young birds resemble adult females.

The Finches are a very large group of birds, found all over the world, except in Australia, but chiefly in cool or temperate regions. They are very poorly represented in Ceylon, the only common species being the ubiquitous House Sparrow, while one other species of a closely allied genus has been recorded as a straggler.

Key to Ceylon Fringillinæ.

A.—A yellow patch on the throat ; bill comparatively long and slender.

Gymnorhis flavicollis flavicollis (Yellow-throated Sparrow).

B.—No yellow patch on throat ; bill short and stout.

Passer domesticus indicus (House Sparrow).

GYMNORHIS FLAVICOLLIS FLAVICOLLIS.

The Yellow-throated Sparrow.

Gymnorhis flavicollis (Oates, Vol. II., p. 235) ; *Passer flavicollis* (Legge, p. 605).

Description.—Male : Upper plumage from forehead to tail coverts sandy-brown ; lesser wing coverts cinnamon-red ; median coverts brown with white tips ; greater coverts and

secondary quills brown with buff margins and tips ; primaries darker brown with narrow buff margins ; primary coverts black ; chin dull white ; a rich yellow spot on the throat ; the sides of the head and neck and the breast pale ashy-brown ; rest of lower parts ashy-white, darker on the flanks.

In females the throat spot is paler yellow and the shoulder patch is rufous-brown, not cinnamon-red.

Bill, of males, generally black in winter, brown in summer ; of females always brown ; iris dark brown ; legs and feet dusky-bluish.

Length 5·5 ; wing 3·2 ; tail 2·1 ; tarsus ·6 ; bill from gape ·6.

Distribution.—A mere straggler to Ceylon, only once recorded. Legge came across a flock near Madampe in the Chilaw District in October, 1876, and secured two specimens. It occurs over the greater part of India and ranges into Persia.

Habits.—This species goes about in small parties, or occasionally during the winter, in larger flocks. It may be looked for in thin jungle, open country bordered with trees, also in groves or gardens. The chirrup and flight much resemble those of the House Sparrow.

PASSER DOMESTICUS INDICUS.

The House Sparrow.

Passer domesticus (Oates, Vol. II., p. 236 ; Legge, p. 600).

Description.—Male : Top of head, from forehead to nape, ashy-gray ; lores and round the eye, chin, throat, and middle of breast black, some of the breast feathers with ashy-white tips ; rest of lower plumage ashy-white ; cheeks, ear coverts, and sides of neck white ; a broad chestnut streak over the eye, to the nape ; upper back and scapulars chestnut with broad black streaks ; lower back, rump, and scapulars ashy-gray ; lesser wing coverts chestnut ; median coverts blackish with broad white tips ; greater coverts and innermost quills black with broad rufous margins and paler tips ; remaining quills dark brown with pale rufous edges ; tail feathers grayish-brown with paler edges.

After the autumn moult the feathers of the back and breast have ashy margins, which are soon abraded.

Female.—Top of the head to hind-neck, rump, and upper tail coverts sandy-brown; feathers of back and scapulars pale rufous with blackish inner webs; wing coverts and quills marked as in the male, but both the ground colour and markings are more dingy and in tone with the hue of the back; tail pale brown with light edges; a pale buff stripe over the eye to the nape, with a darker brown stripe below it; sides of head ashy-brown; lower plumage ashy-white, darker on the breast.

Young birds at first resemble the adult female, but the under surface is tinged with buff.

Bill, of males, generally black in winter, horny-brown in summer; of females always brown; iris brown; legs and feet pale brown.

Length 5·7; wing 2·9; tail 2·2; tarsus ·7; bill from gape ·53.

Distribution.—Ubiquitous in every town and village of the Island. The Indian race, which is smaller and lighter than the European form, is found practically throughout the Indian Empire, and extends eastwards to Cochin-China.

Habits.—The Sparrow in Ceylon sticks as closely as in England to the neighbourhood of man, and owing to the more open construction of houses in the east is more of a nuisance inside dwellings than its English relative. It is never found far from habitations, except when the paddy crops are ripening, when with its usual eye to the main chance it visits the fields and threshing-floors in considerable numbers. It feeds on insects, however, as well as on grain. It breeds pretty well all the year round, making a large, untidy nest of dry grass, &c., in any hole or ledge, on the inside or outside of a house, on which it sets its fancy. Once it has settled on a nesting site in any dwelling room or verandah it is most difficult to dislodge. If the nest is demolished, it will be renewed again and again. It will occasionally build in a thick tree or bush. There are usually four, at times five, eggs. They vary a good deal in size and markings. The ground colour is generally

grayish or greenish-white, with markings in various shades of brown or dull grayish-purple, sometimes uniformly distributed, but generally heavier at the large end. Average size .80 by .58.

Family HIRUNDINIDÆ.

Swallows.

The Swallows are a familiar family found all over the world. Their whole structure is adapted to an aerial existence, and their food consists of insects which are captured entirely on the wing. Their wings are greatly elongated; there are only nine primaries, the first being almost as long as the second. The bill is broad, flat, and triangular, with a very wide gape, and the merest trace of a hook at the tip; the rictal bristles are weak. The legs and feet are feeble, and the tarsus is smooth. The tail has twelve feathers, and is generally long and forked. The sexes are alike, and there is only one moult yearly, in the spring. The immature plumage does not greatly differ from that of the adult. Swallows resemble Swifts in their outward form, but there are wide structural differences. The Swift has ten primaries, the first being large, only ten tail feathers, and a hooked bill. The feet of the Swallow are typically Passerine, the Swift has the hind toe either directed forwards or reversible.

Many members of the family are migratory, and found over a wide expanse of the globe; others are resident, and in some cases confined to a small area. All of the species authentically recorded from Ceylon belong to the genus *Hirundo*—or true Swallow—in which the tarsus and toes are bare, and the greater part of the upper plumage is of a highly glossy blue-black.

The Martins have either the tarsus and toes feathered—genus *Chelidon*—or the upper plumage brown and without gloss—*Cotile* and *Ptyonoprogne*. Legge, however, records that two competent ornithologists, Messrs. Bligh & Parker, have observed, without being able to secure, a species of Martin with a darkish under surface (*vide* Legge, pp. 598 and 1217). If specimens are ever obtained, they may possibly turn out to be a species of Crag Martin—*Ptyonoprogne*—either

P. rupestris or *P. concolor*. The former species has a wide range over the Old World, and the latter is found over a great part of India proper. They might, however, possibly be *Chelidon urbica* with a feathered foot. This last species also is found over a wide extent of Europe, Africa, and Asia, and has been recorded as far south as the Nilgiris and Travancore.

Four species of *Hirundo* occur in the Island. One of these is a common migrant, one a chance visitor; the other two are resident, and one of them is peculiar to Ceylon.

Key to Ceylon Hirundinidæ.

A.—Rump same colour as the back.

- (1) A dark glossy band across the chest.

Hirundo rustica rustica (The Swallow).

- (2) No dark band across the chest.

H. javanica (Nilgiri House Swallow).

B.—Rump chestnut, contrasting with the dark back.

- (1) Lower plumage pale rufous, much paler than the ear coverts.

H. daurica erythropygia (Syke's Striated Swallow).

- (2) Lower plumage chestnut of same shade as the ear coverts.

H. hyperythra (Ceylon Swallow).

HIRUNDO RUSTICA RUSTICA.

The Swallow.

Hirundo rustica (Oates, Vol. II., p. 277; Legge, p. 587).

Description.—Forehead, chin, and throat chestnut; lores black; upper plumage, including wing coverts, glossy purplish-blue; wing quills and tail black with a greenish lustre; all tail feathers, except the middle pair, with a white patch on the inner web; sides of the head and neck and a broad band across the breast glossy-black, a few of the feathers on the

breast band fringed with chestnut; rest of lower parts pale rufous, deeper on the tail coverts. In females the lower parts are almost pure white.

The above description applies to the sub-species *H. rustica rustica*, which breeds in Europe and North-western Asia, and winters in Africa and South-western Asia. The Far Eastern race *H. rustica gutturalis*, which breeds in Japan and North-eastern Asia, has the lower plumage below the pectoral band pure white, while the chestnut of the throat encroaches on the black band so as nearly to sever it in the centre. It is also slightly smaller and with a shorter tail. Many of our birds are intermediate between these two races, while there is one specimen in the Museum from the Northern Province, which seems almost typical *gutturalis*.

Yearling birds, of which our visitors largely consist, on their arrival have the top of the head brownish, the forehead grayish, the throat rufescent-white turning in patches to chestnut, and the pectoral band brown. The long outer tail feathers are not fully grown. They assume the adult plumage before leaving in spring.

Bill, legs, and feet black; iris dark brown.

Length up to 7·5; wing 4·6; tail up to 4; tarsus ·4; bill from gape ·57. Females slightly smaller and with shorter tails.

Distribution.—Found all over the Island, but rare at high elevations. As noted above, the European race occurs over the west of the Old World, breeding in temperate climates and wintering in Africa and South-western Asia. In Central Asia this race appears to pass gradually into the eastern form. Many of the birds which winter in the east of India are intermediate between these two races, typical *gutturalis* being seldom found west of the Bay of Bengal.

Habits.—The young birds appear to come first, and arrive, generally *viâ* the north of the Island, about the middle of September. The old birds come a little later. All leave about the middle of April. Both at their coming and going they congregate in large flocks, which seem to find telegraph wires their most convenient perch. They scatter during their stay and hawk far and wide after flying insects.

HIRUNDO JAVANICA.

The Nilgiri House Swallow.

Hirundo javanica (Oates, Vol. II., p. 279 ; Legge, p. 597).

Description.—A broad forehead, chin, throat, upper breast, ear coverts, and cheeks rusty-red ; lores blackish ; upper plumage and lesser wing coverts black with a greenish-blue gloss ; wings and tail rusty-black ; all the tail feathers, except the middle pair, with a white spot on the inner webs ; lower plumage ashy-brown, paling on the centre of the abdomen ; under tail coverts blackish, tipped with white.

In young birds the upper plumage is without gloss, and some of the secondaries have rufous margins ; the lower parts are paler.

Bill black ; iris dark brown ; legs and feet brown.

Length 5 ; wing 4·05 ; tail 1·8 ; tarsus ·35 ; bill from gape ·63 ; tail only slightly forked.

Distribution.—Resident in the hills, where it is common at the higher elevations, but seldom descends as low as 2,000 feet. It is found in the South Indian hills as far north as the Nilgiris, also in the Andamans, Tenasserim, and Malaya, including the Archipelago.

Habits.—The most familiar Swallow in the higher hills. The flight is easy, but not very swift. The birds often have a regular beat, and are fond of the steep-sided railway cuttings through cabook (laterite), which are so common on the up-country line. They are fearless of man, and frequently build their nests in the eaves of verandahs, or even inside rooms. They are, however, equally ready to breed on the little ledges on the face of rocks, or in cabook cuttings, and I have found the nest in the entrance of a railway tunnel. The breeding season is from April to June, and again in September. The nest is a little half cup of mud, firmly glued to the perpendicular surface, against which it is built, and lined with feathers or occasionally small scraps of rag, &c. The two or three eggs are rather broad ovals, slightly pointed at the smaller end. The ground colour is pinkish-white, with dull purple and reddish-brown markings, chiefly at the larger end. Average size ·66 by ·50.

HIRUNDO DAURICA ERYTHROPHYGIA.

Syke's Striated Swallow.

Hirundo erythropygia (Oates, Vol. II., p. 283 ; Legge, p. 594).

Description.—Upper plumage down to the lower back, with the lesser and median wing coverts glossy steel-blue ; rump and shorter upper tail coverts chestnut ; longer tail coverts glossy-black ; remainder of wing and the tail dark brown with a blue gloss on the outer webs ; lores brown ; the feathers under the eye mixed brown and rufous ; ear coverts and a partial collar on the hind-neck chestnut ; sides of the neck glossy-blue ; the whole lower plumage pale rufous with fine brown shaft-streaks ; under tail coverts tipped with black.

Bill and legs black ; iris brown.

Length 6·5 ; wing 4·3 ; tail 3·2 ; tarsus ·5 ; bill from gape ·45.

Distribution.—The Indian race of this Swallow is found over the greater part of the plains of India as far south as the Nilgiris. It is the merest straggler to Ceylon, having been recorded once from the Jaffna peninsula and once from the Uva hills near Haputale.

Habits.—In India this species is found round mosques and other buildings, and also in the vicinity of walls and bridges. The flight is comparatively slow.

HIRUNDO HYPERYTHRA.

The Ceylon Swallow.

Hirundo hyperythra (Oates, Vol. II., p. 284 ; Legge, p. 592).

Description.—Whole upper plumage, including wings and tail, glossy blue-black, except the rump and shorter upper tail coverts, which are dark chestnut ; whole under surface and sides of neck chestnut with narrow indistinct brown shaft-streaks, except on the vent and lower tail coverts ; the latter have broad black tips.

In young birds the chestnut parts are paler, the streaks on the throat and fore-neck are broader, and the breast is mottled with blackish-brown.

Bill blackish-brown ; iris sepia-brown ; legs and feet vinous-brown.

Length 6·6; wing 4·75; tail 3·2; tarsus ·55; bill from gape·6.

Distribution.—A resident species peculiar to Ceylon. It is found all over the low-country and in the central hills up to about 3,000 feet. On the Uva patanas I have seen it at an elevation of about 4,000 feet. In the northern forest tract it is widely distributed, but not very numerous; it is more abundant in the south, especially round Galle, and is occasionally seen in Colombo.

Habits.—May be seen hawking for insects over paddy fields, tanks, marshes, and patanas, as well as round houses in villages and the vicinity of towns. The flight is slower and heavier than that of the common Swallow, but it is often found in company with that species in the low-country and with *H. javanica* in the hills. The breeding season is from April to June. The nest is a solid, retort-shaped structure of mud, glued on to the under surface of a verandah roof, the arch of a bridge or culvert, or the roof of a rock cave. The interior is lined with a felted layer of feathers. The two or three eggs are elongated ovals of pure white without any gloss. Two eggs in my collection measure ·95 by ·57.

Family MOTACILLIDÆ.

Wagtails and Pipits.

The Wagtails and Pipits form a family of rather small, slim-built birds, with straight, slender bills, slender legs and feet, and fairly long tails. The wing has only nine primaries, the first being nearly as long as the second; the inner secondaries—or tertiaries—are elongated, and in the closed wing reach almost, if not quite, to the tip of the longest primary. The rectal bristles are fairly well developed. The family, which is found chiefly in the Old World, especially in the north of Europe and Asia, divides naturally into two groups: Wagtails and Pipits. The Wagtails are most daintily formed birds with longish tails, which they vibrate perpetually while standing or running. They frequent grassy lands, or the banks of streams and tanks, running over the ground in search of insects. Most of the species are migratory, and

none of the five forms found in Ceylon are resident ; two are the merest stragglers to the Island. Four of these species belong to the genus *Motacilla*, in which the sexes are alike or almost so. They undergo, however, striking seasonal changes in plumage as well as various metamorphoses between the nestling and adult stages. In consequence birds of the same species may be seen at the same time and place in very different phases of plumage. The characteristics given in the key, however, will always serve to distinguish our four Ceylon species. The remaining Wagtail is a forest bird, which does not undergo such continual changes.

In the Pipits the family characteristics are not so emphasized. With their soberly streaked upper plumage and shorter tails they resemble the Larks.

Three Pipits are found in Ceylon, all being sub-species of *Anthus richardi*. Two of these forms are migratory, the third is a common resident. The sexes are alike. Immature birds are very spotted beneath, the spots becoming reduced in size and number each year of the bird's life. There is little difference between the summer and winter plumage, but the colours are brightest just after the moult, in autumn.

Key to Ceylon Motacillidæ.

I.—Upper plumage, not streaked. Wagtails.

A.—Central pair of tail feathers of same colour and as long as the adjoining pair. Genus *Motacilla*.

(a) Rare stragglers, plumage white, black, and gray : throat and fore-neck black or with a sharply defined black patch ; hind claw curved and shorter than its toe.

(1) Ear coverts and sides of neck white.

M. alba dukhunensis (White Wagtail).

(2) Ear coverts and sides of neck black.

M. maderaspatensis (Large Pied Wagtail).

(b) Adult plumage largely greenish above, yellow beneath ; young birds may be grayish above and whitish beneath, but have no black patch on fore-neck.

- (1) Tail 3·5 or more, and with three white feathers on each side ; hind claw about ·25 and shorter than its toe.

M. melanope (Gray Wagtail).

- (2) Tail about three and with only two white feathers on each side ; hind claw about ·45, and longer than its toe.

M. flava borealis (Gray-headed Wagtail).

B.—Central pair of tail feathers shorter than the adjoining pair and of a different colour.

- (1) Wing coverts and breast broadly barred black and white.

Dendrognathus indicus (Forest Wagtail).

II.—Upper plumage streaked ; the two outermost feathers on each side of tail largely white. Pipits.

- (1) Length about 7·5 ; tail about 3·2 ; hind claw about ·75 and not much curved.

Anthus richardi richardi (Richard's Pipit).

- (2) Length about 7 ; tail about 2·9 ; hind claw about ·5, and considerably curved.

A. richardi striolatus (Blyth's Pipit).

- (3) Length about 6·5 ; tail 2·4 ; hind claw about ·5, and not greatly curved.

A. richardi rufulus (Indian Pipit).

MOTACILLA ALBA DUKHUNENSIS.

The White Wagtail.

Motacilla alba (Oates, Vol. II., p. 287 ; not in Legge).

Description.—Summer : Forehead, front of crown, sides of head, and of neck clear white ; back of crown, nape, hind-neck, chin, throat, fore-neck, and breast deep black ; upper plumage from the nape, with the lesser wing coverts gray ; upper tail coverts black with white margins on the outer webs ; rest of wing coverts and the inner quills blackish with broad white margins ; rest of quills black with narrow white margins ; two outermost pairs of tail feathers almost entirely white, the rest black ; lower parts from breast white.

In winter the chin, throat, and fore-neck become white and the black of the breast is confined to a narrow crescent-shaped patch, the horns of the crescent extending up the sides of the fore-neck.

Young birds in their first autumn resemble adults in winter plumage, but the back of the crown, the nape, and hind-neck are gray, like the back, while the white parts of the head are tinged with primrose-yellow.

Bill black, bluish beneath; iris brown; legs, feet, and claws blackish-brown.

Length about 7·75; wing 3·5; tail 3·6; tarsus ·85; bill from gape ·75.

Distribution.—A recent addition to our list. At the end of November, 1917, I saw several strange Wagtails on the maidan at Puttalam, and secured one which proved to be a young male of this form. The other birds stayed for some weeks, but left at the end of January. This species occurs over most of the Old World, breeding in the north of its range, from the British Isles to Eastern Siberia, and wintering in Southern Europe, Northern Africa, and Southern Asia. It is divided into several sub-species, the present race breeding in Central Siberia and wintering in India and Burma. It seldom, however, penetrates as far as the south of India, though possibly it may occasionally visit the Island unnoticed among other Wagtails.

Habits.—The birds I saw frequented the grassy flats round Puttalam resthouse along with numbers of the Gray-headed Wagtail. It might be looked for on open grassy spaces, wherever there are troops of the last-mentioned species

MOTACILLA MADERASPATENSIS.

The Large Pied Wagtail.

Motacilla maderaspatensis (Oates, Vol. II., p. 291; Legge, p. 607).

Description.—Male: A broad white eyebrow from the nostril to the nape; head, neck all round, and upper plumage to the tail coverts glossy-black; lesser and median wing

coverts less glossy-black ; greater coverts almost entirely white ; quills black bordered with white ; two outer pairs of tail feathers almost entirely white, the remainder black with narrow white edges ; lower parts from breast downwards white, the flanks grayish.

Females are smaller, and their upper plumage is tinged with gray.

Young birds are grayish-brown where the adults are black ; the white eyebrow does not extend forward of the eye ; there is some white on the chin and throat, and the white parts are tinged with buff.

Bill, legs, and feet black ; iris dark brown.

Length about 8·75 ; wing 3·9 ; tail 4·1 ; tarsus 1 ; bill from gape ·8.

Distribution.—A very rare straggler to Ceylon, having been recorded once from one of the islands of the Northern Province. In India it is resident, and is found ovre practically the whole of India proper.

Habits.—A true Water Wagtail, which is rarely found far from water. It may be looked for near rivers, tanks, &c. It is very active in all its movements. It feeds on insects, and will even tackle dragon-flies.

MOTACILLA MELANOPE.

The Gray Wagtail.

Motacilla melanope (Oates, Vol. II., p. 293 ; Legge, p. 610).

Description.—Male in winter : Top and sides of head, hind-neck, back, scapulars, and lesser wing coverts ashy-gray with a brownish-green tinge ; rump and upper tail coverts yellowish-green ; outermost pair of tail feathers entirely white, next two pairs with some black on the basal portion of the outer webs ; three middle pairs black with greenish margins ; medium and greater wing coverts and quills dark brown with white margins, which disappear on the outer primaries ; a narrow,

dull white eyebrow from the lores to the ear coverts ; chin, throat, and fore-neck white ; rest of lower parts bright yellow, deepest on the vent and under tail coverts.

In spring the lores change to dark brown, the white eyebrow becomes broader and clearer, and the ear coverts dark slate-colour ; the chin, throat, and fore-neck become black with small white edges to the feathers, and there is a broad white moustache stripe down the sides of the neck. Our birds appear to leave before this change is much advanced.

Females in winter resemble males ; in summer the dark throat patch is represented by a row of dark brown spots on each side of the throat and neck ; the lower parts are less bright yellow.

Young birds on their arrival resemble adults in winter, but the chin and throat are tinged with yellow, and the rest of the lower parts are less bright, at times almost white.

Bill horn-colour, paler at the base of the lower mandible ; iris brown ; legs and feet flesh-colour.

Length about 7·5 ; wing 3·15 ; tail 3·7 ; tarsus ·75 ; bill from gape ·7 ; hind claw, measured straight from base to tip ·25.

Distribution.—A regular migrant, arriving about the middle of September, and staying near the coast for a few days after its arrival. The birds then move on, some to the interior of the northern forest tract, but the majority to the hills. They leave again about the end of March.

This species has a wide range, breeding in the temperate climates of Europe and Asia and on the Himalayas, and wintering in Northern Africa and Southern Asia.

Habits.—May occasionally be seen in the sandy beds of rivers in the northern forest tract, but in the hills it is a very familiar species along the streams and water-courses. It is fond of perching on the roofs of houses, on tree stumps and bushes, as well as on rocks in the stream bed. When perched or running it perpetually balances its tail. The flight is undulating, but swift ; the note is a cheerful little whistle. It is by no means shy.

MOTACILLA FLAVA BOREALIS.

The Gray-headed Wagtail.

Motacilla borealis (Oates, Vol. II., p. 294 ; Legge, p. 617).

Description.—Male on arrival in autumn : From forehead to hind-neck slaty-gray ; back, scapulars, and rump dull olive-green ; upper tail coverts dark brown edged with olive-green ; four middle pairs of tail feathers black with narrow yellowish-green edges ; two outer pairs mainly white ; wing coverts and quills blackish-brown with pale margins often tinged with yellowish-green ; lores and cheeks dark brown ; usually an indistinct whitish eyebrow ; lower parts yellow, the sides of the chest brown ; at times the centre of the breast is mottled with white and blackish-brown.

During the winter the upper parts become worn and browner, and the black bases of the breast feathers become conspicuous.

In summer plumage, to which some birds change before leaving, the head from forehead to nape is dark bluish-gray ; the upper parts become greener, the pale borders of the wing feathers more yellow ; the lores, cheeks, and ear coverts are black, and the whole lower plumage bright yellow.

Females in winter resemble males ; in summer both the upper and lower plumage is duller ; the lores, cheeks, and ear coverts are brown, and the black bases of the breast feathers more conspicuous.

Birds in their first autumn are rather different ; the upper parts are grayish-brown, which shades into gray-blue on the rump ; the upper tail coverts are black edged with gray ; the tail and wings as in the adult, but the edges of the wing feathers are white ; there is a broad whitish eyebrow ; lores and ear coverts grayish-brown ; lower parts white, the breast darker and at times mottled with brown.

Bill, blackish-brown, paler at the base of the lower mandible ; iris brown ; legs and feet dark horn-colour.

Length about 6·75 ; wing 3·2 ; tail 3·1 ; tarsus ·9 ; bill from gape ·7 ; hind claw measured straight ·45.

Distribution.—The Gray-headed Wagtail, divided into several geographical races, is found over the greater part of the Old World, breeding in the north and wintering in the south. The present sub-species breeds in Northern Europe and Western Siberia, wintering in Africa and in Southern Asia as far east as the Malay Peninsula. It is one of our commonest Passerine migrants, arriving about the middle of September. It is abundant during the north-east monsoon all over the low-country, but is less numerous in the south-east of the Island than in the north. In the hills it is not nearly so common as the last species. It leaves for the most part in April.

Habits.—On its first arrival this Wagtail may be seen in swarms on grassy flats near the sea in the west and north of the Island. A number of birds remain in these haunts. Others spread inland to newly ploughed paddy fields, grassy land round tanks, &c. They are restless birds continually running about or taking short flights in their hunt for flies and other small insects. They roost at night in large colonies in the long grass of swamps, &c.

DENDROGNATHUS INDICUS.

The Forest Wagtail.

Limonidromus indicus (Oates, Vol. II., p. 300 ; Legge, p. 614).

Description.—Upper plumage, including ear coverts and lesser wing coverts, dull olive-green ; tail coverts blackish-brown ; median and greater wing coverts black with broad whitish tips, which form two conspicuous wing bars ; wing quills brown, the innermost secondaries with broad olive-brown tips, remaining quills with edges of yellowish-white on the central portion of the outer webs ; most of the primaries also with a patch of the same colour near the base ; middle pair of tail feathers the same hue as the back ; next three pairs blackish-brown, the next pair white with broad brown bases, the outermost pair almost entirely white ; cheeks, chin, throat, and lower plumage white with a yellow tinge on the chest, which is crossed by two broad black bands, the lower band being incomplete in the middle.

Bill, upper mandible dark brown, lower flesh-colour; iris olive-brown; legs and feet flesh-colour.

Length 6·5; wing 3·1; tail 2·8; tarsus ·85; bill from gape ·75.

Distribution.—A migrant, breeding in Northern China and Eastern Siberia, and wintering from India eastwards to Southern China, but rare in most parts of India.

In Ceylon it is almost confined to the northern forest tract, but may occasionally be met with elsewhere.

Habits.—Generally found by the grassy sides of roads running through forest. It is, for instance, fairly numerous from October to March on the sides of the roads leading from Puttalam to Anuradhapura and Kurunegala. The birds are generally in pairs, which keep flying in front of one in little flights of about 100 yards, perching on low branches, and moving on as one catches up with them. They will continue in this manner for some distance before they double back. When hunting for food they run about on the ground and wag their tails from side to side, instead of up and down as other Wagtails do.

ANTHUS RICHARDI RICHARDI.

Richard's Pipit.

Anthus richardi (Oates, Vol. II., p. 307); *Corydalla richardi* (Legge, p. 621).

Description.—Upper plumage fulvous-brown, the feathers of the head and back with dark brown centres; wings dark brown with brownish-buff margins; outermost tail feathers almost entirely white, the next pair brown at the base, along the shaft and on the marginal portions of the inner web, the rest dark brown with paler edges; a broad buff stripe above the eye; lower plumage brownish-buff; the sides of the throat, the fore-neck, and breast streaked with dark brown.

Bill brown, paler beneath; iris brown; legs flesh colour.

Dimensions a little variable; length about 7·7; wing 3·75; tail about 3·2; tarsus 1·2; bill from gape ·8; hind claw about ·75, and not greatly curved.

Distribution.—This, the largest race of the species, breeds in Central Asia and Siberia. In winter it is found over a wide extent from the British Isles and France to China; it occurs at this season over the eastern half of India proper and the whole of Burma. In Ceylon it arrives about the beginning of October, and some birds linger till May. It spreads fairly widely throughout the low-country, but is found chiefly in the maritime districts. It occurs on the hills on some of the lower patanas, but does not appear to ascend to any great elevation. In Colombo it is not much seen before February, apparently visiting that part of Ceylon only on its return journey.

Habits.—Usually met with on pastures and grassy flats, especially near the sea, in company with its smaller resident relative *A. r. rufulus*. It may sometimes be found, generally just after its arrival or before its departure in the longer grass of marshy lands. It is a swift runner, and has a rapid undulating flight.

ANTHUS RICHARDI STRIOLATUS.

Blyth's Pipit.

Anthus striolatus (Oates, Vol. II., p. 308); *Corydalla striolata* (Legge, p. 628).

Description.—In plumage it resembles *A. r. richardi*, but is rather smaller; the tarsus and feet are shorter and the hind claw is considerably shorter and more curved.

Length about 7; wing 3·5; tail 2·9; tarsus 1; bill from gape ·75; hind claw ·5, and considerably curved.

Distribution.—Breeds at high elevations on the Himalayas and winters throughout the Indian Empire. Not very much is known of its distribution in Ceylon, but it probably escapes notice owing to its resemblance to Richard's Pipit. The only authentic record of its occurrence in the Island is by Legge, who found it south of Trincomalee near the Virugal-o-ya.

Habits.—Resemble those of Richard's Pipit. It may be looked for on pasture lands near the sea. It runs about actively, with sudden halts, and holds itself very erect. According to Brookes, it rises with a loud discordant note.

ANTHUS RICHARDI RUFULUS.

The Indian Pipit, or Tittlark.

Anthus rufulus (Oates, Vol. II., p. 308); *Corydalla rufula* (Legge, p. 625).

Description.—A much smaller edition of *A. richardi richardi*, but the tone of the upper plumage is grayer and the lower parts generally whiter. The bill is proportionately larger.

Dimensions a little variable. Length about 6·5; wing 3·15; tail 2·4; tarsus 1; bill from gape ·75; hind claw ·5.

Distribution.—A resident form, found throughout the Indian Empire and thence south-east to the Malay Archipelago and the Philippines. It also occurs over a great part of Africa. It is found abundantly throughout the whole Island, except at the very highest elevations, such as the Horton Plains, where it is scarce.

Habits.—May be met with everywhere, on grassy flats near the sea, pastures, dry paddy fields, and open patanas. It is very tame and fearless, and runs about actively through the heat of the day. The flight is swift and undulating. It breeds during the dry weather from April to July. The nest is a small cup of dry grass and grass roots, well concealed in a slight depression under the shelter of a tussock of grass. The lining is of finer material than the outside of the nest. The two or three eggs are almost oval in shape. The ground colour is whitish, or at times greenish stone, generally fairly thickly spotted with dull brown and occasionally fainter markings of dingy purple. I have two clutches which are much darker and with deep brown, streaky markings covering the greater part of the surface. Average size of a fair Ceylon series ·80 by ·60.

Family ALAUDIDÆ.

Larks.

The typical Larks closely resemble the Pipits, having the same soberly streaked plumage and long inner secondaries. They are, however, slightly plumper in form, the bill is not quite so slender, and the tail a little shorter, while unlike the Pipits they soar and sing while soaring. They are also distinguished from them and from all other Indian Passeres by the transversely scutellated hinder aspect of the tarsus.

In all the other families the hinder aspect of the tarsus is covered by two long "laminæ" or thin scales, which run, one on each side of the back edge of the tarsus, from the toes to the tarsal joint. In the Larks this covering consists of several scales on each side, which are set transversely and overlap.

All the Ceylon forms have ten primaries, the first being always small, and in one form microscopic. In some outside genera the first primary is altogether wanting. The wing, as a rule, is somewhat pointed, the head is often crested, but no Ceylon species has a perceptible crest. The shape of the bill varies considerably in the different genera, but the edges of the mandibles are smooth, except for a slight notch in the upper one. The rictal bristles are well developed.

Larks are found all over the Old World, but only one genus occurs in America and they are unknown in Australia. They are somewhat gregarious, and generally frequent cultivated or open grass lands, while many are desert-loving species. Three forms, each belonging to a different genus, occur in Ceylon. The main generic distinctions are given in the following key.

Key to Ceylon Alaudidæ.

A.—Sexes similar ; bill moderate ; length about 6.

- (1) First primary exceedingly minute ; nostrils concealed by plumelets ; wing somewhat pointed ; outside tail feather almost entirely white, the next with a whitish outer web and tip ; hind claw long and straight.

Alauda gulgula australis (Indian Sky Lark).

- (2) First primary nearly half length of second ; nostrils exposed ; wing round ; outside tail feather brown with a rufous-white border on the outer web ; hind claw long and curved.

Mirafra affinis (Madras Bush Lark).

B.—Sexes dissimilar ; bill short and deep ; length about 5 ; nostrils covered with plumelets ; tarsus short.

Pyrhulauda grisea grisea (Ashy-crowned Finch Lark).

ALAUDA GULGULA AUSTRALIS.

The Indian Sky Lark.

Alauda gulgula (Oates, Vol. II., p. 326 ; Legge, p. 630 and 1217).

Description.—Feathers of upper plumage rich, dark brown broadly edged with brownish-buff ; on the hind-neck and upper back the margins are very broad, the brown being reduced to a wide shaft-stripe ; wing coverts slightly paler brown and with whitish tips ; wing quills brown with fulvous margins, the outer webs tinged with rufous at the base ; the outside tail feather almost entirely buffy-white ; the next with the outer web and extreme tip buffy-white, rest of tail brown with paler margins ; a whitish streak from the nostrils over the eye ; ear coverts and cheeks streaky-brown ; lower plumage pale, slightly rufous-buff, the breast boldly streaked with dark brown ; sides of the body more faintly streaked.

Young birds are more rufous ; the feathers of the upper surface are rounded and white at the tips.

Bill dark horny-brown above, paler beneath ; iris brown ; legs fleshy-brown.

Dimensions rather variable ; length about 6·3 ; wing 3·35 ; tail 2·1 ; tarsus ·9 ; bill from gape ·7.

Distribution.—The Indian Sky Lark is found almost throughout the Indian Empire, and ranges eastwards to Southern China and the Philippines. The present sub-species occurs in Southern India and Ceylon. With us it appears to be resident all the year round in the drier parts of the low-country. In the damp west and south-west it is only a north-east monsoon visitor, probably because it nests on the ground, and in these parts cannot be sure of a dry spell during the breeding season. It is also resident in the drier hill country, and I have found it breeding at 4,500 feet on the Uva Patanas.

Habits.—Much the same as those of the English Sky Lark. It is fairly abundant on the grassy flats round the coastal lagoons and at the head of some of the larger inland tanks. The song is not so loud or sustained as that of the English Sky Lark, nor does it mount and sing for so long a period. The breeding season is during the dry weather, from April

to July. The nest is a neatly made little cup of grass and grass roots, lined with finer materials of the same nature and built in a little depression of the ground under the shelter of a tussock of grass. The two or three eggs are slightly pointed ovals in shape. There are two types. In one the egg is a dull whitish stone-colour, thickly spotted, chiefly at the larger end, with dull, dark brown over fainter marks of dingy purplish-gray. In the other the colour is a more glossy whitish with smaller and more evenly scattered freckles of yellowish-brown and dull gray. Average size $\cdot 84$ by $\cdot 60$.

MIRAFRA AFFINIS.

The Madras Bush Lark.

Mirafra affinis (Oates, Vol. II., p. 335; Legge, p. 634).

Description.—Upper plumage and wing coverts dark brown with broad, brownish-buff margins, which are paler on the hind-neck and wing coverts; wing quills brown with rufous margins and a rufous area on the basal portions of the inner webs; tail feathers brown with pale rufous edges, the outside feather with a broader edge on the outer web; lores brownish; an indistinct buff streak over the eye; ear coverts and cheeks buff streaked with brown; lower parts whitish-buff, palest on the chin and throat, the lower throat and the breast streaked with broad, triangular patches of rich brown; flanks tinged with brown.

Bill: upper mandible dark brown, the margin and lower mandible, except the tip, flesh-coloured; iris reddish or yellowish-brown; legs and feet fleshy-white.

Dimensions rather variable: length about 6; wing $3\cdot 2$; tail 2; tarsus 1; bill from gape $\cdot 7$.

Distribution.—Common all over the low-country, except in the dampest districts where it is not so abundant. It is not found in the hills except as a straggler. It also occurs over a large part of Southern India.

Habits.—Found wherever there is dry pasture or any little open stretch of dry grass. It is fond of perching on bushes or dead branches of trees. The song is sweet, but low and not nearly so sustained as that of the Sky Lark. The bird

when singing mounts rapidly for a short distance and then sinks down with its wings extended. The breeding season is from about April to July. The nest much resembles that of the Sky Lark, and is placed in similar situations, but is at times more or less domed with a thin covering concealed among the dry stems and blades of the tussock of grass, in the shelter of which it is placed. The two or three eggs are rather broad, slightly pointed ovals. The ground colour is whitish with generally a fair amount of gloss. The markings vary a good deal in size and density, and range from reddish to yellowish-brown over paler marks of dull purple and purplish-gray. Average size .84 by .63.

PYRRHULAUDA GRISEA GRISEA.

The Ashy-crowned Finch Lark.

Pyrrhulauda grisea (Oates, Vol. II., p. 341; Legge, p. 637).

Description.—Male: Upper plumage ashy-brown, the feathers with pale gray margins, which are broadest on the forehead and crown; wing coverts and quills dark brown with whitish-gray margins, wider and more conspicuous on the coverts and inner quills; tail feathers light brown with whitish edges, the outer feather at times almost wholly white; lores, front part of cheeks, a streak over the eye, chin, throat, sides of neck, and lower parts to the tail coverts brownish-black; hind cheeks and ear coverts white; a grayish-white patch on the sides of the breast.

Female: The upper plumage is darker brown, at times tinged with rufous; the gray margins are narrower and darker, the whitish margins of the wing feathers not so conspicuous; ear coverts brown and gray, like the crown; those parts, which in the male are black or white, are grayish-white with ill-defined, dingy brown streaks.

Immature birds resemble females, but the margins on the upper plumage are broader and more distinct.

Bill whitish in males, a little darker in females; iris dark brown; legs and feet flesh-colour.

Length about 5; wing 3; tail 1.75; tarsus .6; bill from gape .5.

Distribution.—This little species is found in the plains throughout the greater part of India proper. The Ceylon form appears to be a good sub-species, which probably also occurs in the dry south-east corner of India. With us it is confined to the dry maritime zones of the north, north-west, and south-east, but it occasionally straggles, probably storm-driven, to other parts, and has been seen in Colombo and at the top of Ramboda Pass.

Habits.—Found in little troops on arid plains near the coast. It feeds on the ground and squats very close, occasionally taking short little flights in the air, when it gives out a cheerful but weak little warble. The breeding season is from May to July. The nest is placed in a small depression on the bare plain, right out in the open, occasionally in the centre of an old desiccated patch of cowdung. It is a minute, shallow cup of fine, dry grass and grass roots, with occasionally a scrap of wool in the thin lining. The top is neatly levelled off flush with the surface of the ground so that the nest absurdly reminds one of a hole in a bagatelle board. There are only two eggs. The ground colour is whitish, rather sparingly, but evenly freckled with fine spots of yellowish-brown. Occasionally the markings form a zone round the middle. Average size $\cdot 75$ by $\cdot 54$.

Family ZOSTEROPIDÆ.

Genus *Zosterops*.

White-eyes.

The White-eyes are a group of which the classification has been much in dispute. Oates has placed them among the *Crateropodidæ*, other ornithologists either with the Sunbirds—*Nectariniidæ*, the Flowerpeckers—*Dicaeidæ*, or the Honey-eaters—*Meliphagidæ*. Their natural affinities, on the whole, seem to be near the Sunbirds, and I have followed Stuart Baker, who accords them family rank and places them just before that group. They are all very small, arboreal birds, which are found over a great part of Africa and in Southern Asia and Australia. The bill is curved, slender, and pointed,

the rectal bristles are few and small. The tongue is peculiar ; according to Gadow, it is split into two and each half is broken up into numerous, stiff, horny fibres, like a little brush. The nostrils are covered by a large membrane and the eye is surrounded by a velvety fringe of small white feathers—a very characteristic mark of the family. The wing is short and rounded ; there are ten primaries, the first being microscopic. The tail is short and square, the legs and feet weak. Two species occur in Ceylon, one of which is peculiar to the Island.

Key to Ceylon Zosteropidæ.

- (1) Upper plumage greenish-yellow.

Zosterops palpebrosa palpebrosa (Indian White-eye).

- (2) Upper plumage dark olive-green.

Z. ceylonensis (Ceylon White-eye).

ZOSTEROPS PALPEBROSA PALPEBROSA.

The Indian White-eye.

Zosterops palpebrosa (Oates, Vol. I., p. 214 ; Legge, p. 582).

Description.—Upper plumage greenish-yellow, slightly purer yellow on the forehead and upper tail coverts and on the sides of the neck, where it blends into the primrose-yellow of the throat and fore-neck ; wings and tail brown, edged with the same greenish-yellow hue as the sides of the neck ; a ring of white feathers round the eye ; lores and a small streak below the eye black ; breast, abdomen, and flanks grayish-white, the centre of the abdomen at times faintly washed with yellow ; under tail coverts yellow ; wing-lining white.

Bill blackish, bluish at base of lower mandible ; iris rather variable, generally grayish or brownish-olive ; legs and feet slate blue.

Length 4·25 ; wing 2·1 ; tail 1·6 ; tarsus ·6 ; bill from gape ·47.

Distribution.—Found all over the low-country and in the hills to about 4,000 feet, above which it is replaced by the next species. This White-eye, divided into several races, occurs all over India proper and in part of Upper Burma.

Habits.—A rather gregarious little bird, which associates in flocks or small parties, hunting among the leafy boughs of trees, either in forests or gardens. It feeds partly on insects, partly on buds and flowers. The breeding season is mainly from June to August. The nest is a dainty little cup of tendrils, fine grass stalks, and moss woven together with cobwebs, and generally lined with a little vegetable down. It is placed in the slender fork of a small branch about 6 to 20 feet from the ground. The two eggs are pale, uniform blue, and are rather pointed at the small end. Average size $\cdot 62$ by $\cdot 46$.

ZOSTEROPS CEYLONENSIS.

The Ceylon White-eye.

Zosterops ceylonensis (Oates, Vol. I, p. 215; Legge, p. 585).

Description.—Upper plumage and sides of neck dark olive-green, paler on the rump and darker on the crown and forehead; wings and tail brown edged with the green of the back; a ring of white round the eye; lores and a small streak below the eye blackish; chin, throat, neck, and upper breast, thighs and tail coverts greenish-yellow; lower breast, abdomen, and flanks grayish-white, the abdomen at times tinged with yellow; wing-lining white.

Bill blackish, base of lower mandible bluish or slaty; iris variable, generally yellowish or reddish-brown; legs and feet bluish or pale leaden.

Length $4\cdot 6$; wing $2\cdot 2$; tail $1\cdot 7$; tarsus $\cdot 65$; bill from gape $\cdot 6$.

Distribution.—Peculiar to Ceylon and confined to the hills down to about 3,000 feet.

Habits.—Gregarious like the last species. It is found in little flocks among forest, in trees and bushes on open places near woods, or in leafy gardens. It breeds from March to May. The nest and eggs closely resemble those of the last species. Average size of eggs $\cdot 64$ by $\cdot 45$.

Family NECTARINIIDÆ.

Sub-family *Nectariniinæ*.*Sunbirds.*

The Sunbirds are a family of small birds, which, in the Tropics of the Old World, correspond to the Humming Birds of Tropical America. Together with the next family—*Dicæidæ*—they are characterized by the finely serrated edges on the terminal third of each mandible. The tongue is tubular; the bill long, curved, and cylindrical; the rictal bristles are short; the wings moderate; there are ten primaries, the first being small; the legs and feet are weak, the claws curved and sharp.

The sexes are markedly different; the males are clad mainly in brilliant metallic hues, the females in a more sober garb, generally of pale brown above and yellow beneath. Most field observers are of the opinion that for two or three months in the year the males of most species drop their breeding plumage and more or less resemble females. Oates, however, after examining the large series from India in the British Museum, states that this cannot be so, as the series includes males, in full plumage, shot in practically every month of the year, and that it is only immature males which resemble the hens. His data may, however, be accounted for by the fact that the off-season plumage is, admittedly, worn for only a short period, and that the breeding season, as often happens in India, overlaps in different localities, or even in some districts, with different birds.

Sunbirds are entirely arboreal, and feed mainly on nectar, which they extract from blossoms with their long tongues. They do not, however, hover on the wing, for sustained periods while sipping, as do Humming Birds, but cling, while feeding, to an adjoining stem. They nearly all build the most beautiful little pear-shaped nests, which are hung from a twig or the under side of a broad leaf, but one Ceylon species—*Loten's* Sunbird—as will be noted, is an exception to this rule.

Four species have been recorded from Ceylon, all belonging to one genus—*Arachnechthra*—of the sub-family *Nectariniinæ*. The other Indian sub-family, the Spider Hunters—*Arachnotherinæ*—is not represented in the Island.

Key to Ceylon Nectariniinae.

A.—Bill large, over .75 inch* ; males in full plumage with metallic and dark hues ; females pale brown above, uniform dingy yellow beneath.

- (1) Bill over 1 inch ; males with snuff-brown abdomen.

Arachnechthra lotenia (Loten's Sunbird).

- (2) Bill .8 inch ; males with blue-black abdomen.

A. asiatica (Purple Sunbird).

B.—Bill smaller, .6 inch* ; males with brilliant plumage above and on fore-neck and upper breast ; lower breast and abdomen in both sexes yellow.

- (1) Males : upper tail coverts metallic red ; females : uniform pale yellow beneath, rump and upper tail coverts dull red.

A. minima (Small Sunbird).

- (2) Males : upper tail coverts metallic purple ; females : chin and throat ashy-white ; rest of lower parts bright yellow.

A. zeylonica (Purple-rumped Sunbird).

ARACHNECHTHRA LOTENIA.

Loten's Sunbird.

Arachnechthra lotenia (Oates, Vol. II., p. 358) ; *Cinnyris lotenius* (Legge, p. 563).

Description.—Male in full plumage : Head, upper plumage, and lesser wing coverts metallic green, changing to lilac according to the angle from which it is viewed ; greater coverts and wings deep brown ; tail black glossed with purple ; chin and throat dull purple with, in certain lights, a metallic green gloss, which becomes more brilliant on the sides of the neck ; breast a stronger purple ; rest of lower parts snuff brown, separated from the purple of the breast by a band of maroon red ; on each side of the breast a small yellow tuft, at times mixed with orange.

* I.e., the distance in a straight line from gape to tip.

Female: Upper plumage, including wings and sides of head and neck, olive-brown; tail black, the outer feathers with brownish-white tips; lower parts dull yellow.

Males after the autumn moult resemble females, with the exception of a broad metallic stripe down the fore-neck and a certain amount of metallic gloss on the lesser wing coverts and tail coverts. The breeding plumage is gradually assumed after a few weeks.

Bill, legs, and feet black; iris brown.

Length 5·5; wing 2·3; tail 1·6; tarsus ·6; bill from gape 1·1. Females are slightly smaller.

Distribution.—Common in most parts of the low-country, except in the arid coast zone of the north, north-west, and south-east. It occurs in the hills up to about 3,000 feet, in certain localities considerably higher. It is also found in Southern India.

Habits.—Familiar in flower gardens throughout its range. In the jungle it avoids forest, and is commonest in open bushy spaces near trees. It feeds mainly on the nectar and pollen of flowers, and is very partial to *Hibiscus* blossoms. At times it eats small spiders and other soft insects. The breeding season is from February to May. The nest is usually, not the little hanging structure made by most species, but placed in the large flocculent masses of cobweb spun in low bushes by a certain species of spider.

In the interior of the mass the birds press out a more or less globular chamber, lining the walls with vegetable down, and generally providing a little eave of cobweb over the entrance, which is at one side. If spider's webs are not available, they appear on occasions to construct a little pear-shaped, hanging structure like that of the next species. The two or, very rarely, three eggs are long ovals, rather pointed at the small end. The ground colour is grayish-white, evenly marked all over with fine, streaky spots of grayish-brown, at times with a dull purplish or greenish tinge. Occasionally the marks are concentrated in a zone towards the large end. Average size ·69 by ·46.

ARACHNEOTHRA ASIATICA.

The Purple Sunbird.

Arachneothra asiatica (Oates, Vol. II., p. 359) ; *Cinnyris asiaticus* (Legge, p. 568).

Description.—Male in full plumage : Upper parts, including lesser wing coverts and sides of head and neck, metallic green glossed with purple when viewed at certain angles ; greater wing coverts and wings dull, dark brown very faintly washed with purple ; tail black glossed with purple ; chin, throat, and fore-neck dark metallic purple ; breast metallic greenish-blue glossed with purple ; pectoral tuft yellow, at times streaked with orange ; remainder of lower parts black, shot with deep blue ; lower tail coverts more metallic and glossed like the breast ; below the breast there is at times an incomplete dull maroon band.

Female : Upper plumage pale olive-brown ; wing coverts and quills darker and with pale edges ; tail blackish with narrow whitish tips on the outer feathers ; an indistinct whitish eyebrow ; lower plumage fairly bright yellow.

Males after the autumn moult resemble females, except for a broad stripe of purple down the fore-neck, while the wing coverts, quills, and tail remain practically unchanged.

Bill, legs, and feet black ; iris deep brown.

Length 4.5 ; wing 2.25 ; tail 1.4 ; tarsus .55 ; bill from gape .8.

Distribution.—A little local, but found over the greater part of the Island, at all elevations, where there is open bush-covered country ; it is commonest in the drier districts. It occurs all over India and most of Burma and ranges into Persia on the north-west and Cochin-China on the east.

Habits.—Very similar to those of Loten's Sunbird. Like that species it feeds on spiders, &c., as well as on nectar. The breeding season is during the first half of the year. The nest is a beautiful, little pear-shaped structure hung from a twig. The walls are made of all sorts of little scraps of dry grass, dead wood, &c., woven together with cobwebs. The outside is ornamented with little bits of bark, dried flower

buds, empty chrysalis cases, scraps of dead twigs, &c., the interior is lined with soft vegetable down; the entrance is at one side, and is protected by a neat little eave. There are generally two eggs. These are typically a little less elongated than those of the last species. The ground colour is generally brownish-white, evenly marked all over with fine streaky spots of brown; zonally marked specimens are by no means rare. Average size $\cdot 67$ by $\cdot 47$.

ARACHNECHTHRA MINIMA.

The Small Sunbird.

Arachnechthra minima (Oates, Vol. II., p. 363); *Cinnyris minimus* (Legge, p. 572).

Description.—Male in full plumage: Forehead and crown metallic green; lores, cheeks, and ear coverts black; back and scapulars crimson; rump and upper tail coverts bright metallic red with a lilac gloss; lesser and median wing coverts black with crimson tips; greater coverts and quills dull black; chin and throat metallic lilac; upper breast and sides of neck crimson; rest of lower parts pale yellow, separated from the crimson chest by a band of black; pectoral tufts sulphur yellow.

Females: Head, hind-neck, back, and scapulars olive-green; rump and upper tail coverts dull red; tail feathers dark brown with rufous edges; wings brown with olive-green edges to the feathers; lower plumage pale yellow.

After the autumn moult males resemble females, but retain the lilac rump and a little red on the shoulder of the wing.

Bill, legs, and feet black; iris dark brown.

Length about $3\cdot75$; wing $1\cdot9$; tail $1\cdot3$; tarsus $\cdot6$; bill from gape $\cdot6$.

Distribution.—The inclusion of this bird in the Ceylon list rests on the records of Layard and Holdsworth, the former of whom recorded it from the north of the Jaffna peninsula, while the latter stated that it is occasionally seen near Colombo. It may be looked for in the extreme north of the Island. In India it is found on the west of the peninsula, from about Bombay to Cape Comorin.

Habits.—In India this species goes about in little troops of three or four and shifts its quarters a good deal. It is found in gardens and low brushwood. On the Nilgiris it breeds about September. The nest and eggs are small editions of those of *A. asiatica*. Size of eggs about .62 by .42.

ARACHNECHTHRA ZEYLANICA.

Purple-rumped Sunbird.

Arachnechthra zeylonica (Oates, Vol. II, p. 364); *Cinnyris zeylonicus* (Legg, p. 569).

Description.—Male: Forehead, crown, and lesser wing coverts metallic green shot in some lights with lilac; hind-neck, sides of neck, back, scapulars and median coverts, and a band across the fore-neck dull, deep maroon; rump and upper tail coverts metallic purple; greater wing coverts and quills dark brown with rust-coloured edges; tail dull black faintly washed with purple, the outer feathers with traces of a white tip; sides of head copper-brown; chin and throat metallic purple; breast, abdomen, and under tail coverts bright yellow; flanks and wing-lining silky, grayish-white.

Female: Upper plumage grayish-brown, the back tinged with green; upper tail coverts and tail black, the outer tail feathers with traces of a white tip; wings brown, the quills with rufous edges; an indistinct whitish eyebrow; sides of head ash-gray; cheeks, chin, and throat grayish-white; rest of lower parts yellow; flanks and wing-lining silky, grayish-white.

Bill, legs, and feet black; iris red.

Length about 4.5; wing 2.1; tail 1.4; tarsus .6; bill from gape .6.

Distribution.—Common all over the Island, ascending during the north-east monsoon to the highest elevations. It is most abundant in the districts with a fairly heavy rainfall. In India it occurs over the peninsula proper and in Bengal.

Habits.—Familiar in town gardens, but it is also more partial than the other species to heavy jungle and forest. Like our other Sunbirds, it feeds on soft insects as well as on nectar and pollen. The breeding season is mainly during the

first half of the year. The nest is a little pear-shaped structure, like that of the Purple Sunbird, but usually a trifle more globular and more carefully concealed, being generally hung from a twig at the back of a bunch of leaves instead of in plain view. There are two eggs. The ground colour is dull greenish or greenish-white, the markings greenish or olive-brown, often arranged mainly in a zone or a cap near the large end. Average size $\cdot 62$ by $\cdot 46$.

Family DICAËIDÆ.

Flowerpeckers.

Like the Sunbirds, the Flowerpeckers have the terminal third of both mandibles serrated, though the serrations are so fine that the aid of a lens is required to see them, except in a very good light. The bill, however, is short and triangular, not long and cylindrical. The rictal bristles are poorly developed, but in some forms the nostrils are covered by a tuft of hairs.

The wing in certain genera has nine primaries, in others, including all our Ceylon species, there are ten, the first being small. The tail is always short, and the legs and feet weak. Most Flowerpeckers build elaborate little hanging nests resembling those of the Sunbirds.

All the species are of extremely small size. The forms found in Ceylon are rather sober hued, but many of the family are brilliantly coloured. In some species the sexes are dissimilar. The family is found over the Oriental region and a part of Australia. None of them are migratory. Three species, each belonging to a separate genus, occur in Ceylon and one is not found elsewhere.

Key to Ceylon Dicaëidæ.

A.—Bill slender.

- (1) Sexes alike ; lower parts grayish.

Dicaeum erythrorhyncum (Tickell's Flowerpecker).

B.—Bill stout ; lower mandible swollen.

- (1) Sexes dissimilar ; lower parts white and yellow ; nostrils covered with hairs.

Acmonorhynchus vincens (Legge's Flowerpecker).

- (2) Sexes alike ; lower parts ashy-yellow streaked with greenish-brown ; nostrils exposed.

Piprisoma squalida squalida (Thick-billed Flowerpecker).

DICÆUM ERYTHORHYNCHUM.

Tickell's Flowerpecker.

Dicæum erythrorhynchum (Oates, Vol. II., p. 381); *Dicæum minimum* (Legge, p. 574).

Description.—Upper parts ashy-olive, slightly tinged with green towards the rump ; wings and coverts brown, the coverts and inner secondaries with paler edges ; tail blackish-brown ; lores and cheeks whitish, darkening on the ear coverts ; lower parts grayish-white, the sides of the chest darker, the centre of the breast and abdomen tinged with buff.

Bill, dark brown above, fleshy beneath ; iris brown ; legs and feet brownish slate-colour.

Length 3·3 ; wing 1·8 ; tail ·95 ; tarsus ·5 ; bill from gape ·45.

Distribution.—Common all over the Island at all elevations. It occurs over the greater part of India and in portions of Burma.

Habits.—Our smallest bird. It is generally found wherever there are trees infested with the parasitic *Loranthus*, on the berries of which it feeds with avidity. In the forest it also feeds on the berries of jungle creepers. Usually not more than two birds are seen together. It is a restless little species, continually darting from branch to branch. The cry is a sharp, but weak little chirp. The breeding season appears to be from April till August. The nest is generally a pear-shaped

structure, like that of a Sunbird, but I once saw a nest, presumably of this species, like a little hammock suspended at either end from a twig. The two or three eggs are pure white, glossless ovals. Average size $\cdot 6$ by $\cdot 40$.

ACMONORHYNCHUS VINCENS.

Legge's Flowerpecker.

Acmonorhynchus vincens (Oates, Vol. II., p. 382); *Pachyglossa vincens* (Legge, p. 577).

Description.—Male: Top and sides of head, the upper plumage, and lesser wing coverts dull, steel blue, paling a little on the rump; the concealed bases of the feathers black; wings and tail blackish, the coverts and inner secondaries edged with the hue of the back, the secondaries faintly edged toward the tip with bluish-green, the basal portion of the inner webs of the quills white; four central tail feathers unmarked, the remainder with white tips, increasing in breadth on the outer feathers; chin, throat, and chest white; breast saffron-yellow, paling to almost white on the lower tail coverts.

Female: Head and hind-neck ashy-blue; upper plumage olive-brown, tinged with green on the lower back and rump; wings and tail not so black as in the male; lower parts not so brightly coloured.

Bill black, paler at base of lower mandible; iris brownish-red; legs and feet blackish-brown.

Length $4\cdot 1$; wing $2\cdot 35$; tail $1\cdot 2$; tarsus $\cdot 5$; bill from gape $\cdot 45$. Females are slightly smaller.

Distribution.—Peculiar to Ceylon, and confined mainly to the forest of the wet low-country zone, but it has recently been recorded from Pussellawa in the Central Province at an elevation of 3,000 feet.

Habits.—Rather a rare little bird, living entirely among, or near heavy jungle. It associates in small flocks, hunting among creepers on the trunks of trees for berries. Nothing is known of its nidification.

PIPRISOMA SQUALIDA SQUALIDA.

The Thick-billed Flowerpecker.

Piprisoma squalida (Oates, Vol. II., p. 382); *Piprisoma agile* (Legge, p. 579).

Description.—Upper plumage olivaceous-brown, the rump and upper tail coverts tinged with green; wings and tail brown edged with olive, the tail feathers with white tips, broad on the two outer feathers, more narrow on the others; lores grayish; face and ear coverts brownish; chin and throat white; a narrow brown streak down each side of throat; lower parts pale ashy-yellow with greenish-brown streaks.

Bill leaden brown; iris orange with a golden inner circle legs dusky lead-colour.

Length 4; wing 2·2; tail 1·1; tarsus ·5; bill from gape ·4.

Distribution.—Rather rare; its chief haunts appear to be in the interior of the northern forest tract, but it occurs sparingly in Uva and parts of the Central Province. It occurs over a great part of India proper.

Habits.—Keeps rather to the tops of trees in forest, where it feeds on spiders and small insects. The breeding season is probably in April and May. The nest resembles a little pocket, with the opening at one side, hung from a twig. It is composed of vegetable fibres and flower buds felted together with cobwebs so firmly that it can be squeezed up and yet regain its shape. The two or three eggs are white or pinkish, freckled over with small brownish-pink or claret-coloured spots. Average size (of Indian eggs) ·63 by ·45.

Family PITTIDÆ.

Pittas.

The Pittas (*vide* my introductory remarks on the Order) are the sole Indian family belonging to the group *Mesomyodi*. In addition to the different structure of the syrinx, they are also distinguished from all other Indian Passerine birds by the formation of the wing. There are ten primaries, but the first, instead of being notably small, is almost as long as the second. Their long legs, very short tail, and beautiful

distinctive colouration also serve to render their identification easy. Pittas occur all over South-eastern Asia, being most numerous in the Malay Archipelago. Some species extend into Australia, while one is found in Africa. They all live on the ground, and are insectivorous. They can hop and run well. Most species are found in thick undergrowth, and many of them are more or less migratory. Only one form is found in Ceylon, and it occurs only as a migrant.

PITTA BRACHYURA.

The Indian Pitta.

Pitta brachyura (Oates, Vol. II., p. 393); *Pitta coronata* (Legge, p. 687).

Description.—Forehead and crown yellowish-brown, divided in the centre by a slightly irregular black band, running back to the nape and bordered below by a narrow white band over the eye; a broad black band from the gape of the bill across the face and ear coverts, merging on the nape with the median black band; a few feathers below the eye whitish; back, scapulars, and upper rump green, the upper back more or less washed with light brown; lower rump and upper tail coverts shining turquoise-blue; tail black tipped with dull blue; lesser wing coverts shining turquoise-blue with a black patch where the wing joins the back; median coverts and innermost secondaries green; greater coverts green, the outer feathers washed with blue and with black bases; primary coverts black; primaries black with grayish tips and a white band across their bases; secondaries black with white tips and a broad border of bluish-green on the terminal half of the outer webs; chin, throat, and sides of neck up to the black band white; remainder of lower parts fawn colour; the middle of the abdomen, vent, and lower tail coverts scarlet.

Bill blackish, the ridge and basal part of lower mandible reddish-brown; iris dark brown; legs and feet flesh-colour.

Length about 7; wing 4.1; tail 1.7; tarsus 1.4; bill from gape 1.1.

Distribution.—A fairly common north-east monsoon migrant, arriving in October and leaving in April. It spreads all over the Island, but only occasionally visits elevations of over 5,000 feet. It occurs over practically the whole of India proper, but in many parts in the north and south of its range it is a seasonal migrant.

Habits.—A shy bird, which keeps to thick cover in undergrowth, secondary jungle, and thick woods. It may occasionally be seen in the evening flitting from one cover to another. Its presence is usually made known by its shrill rather pleasant call, which is uttered chiefly in the early morning and evening, and is well expressed by the vernacular names—*avichchiya* in Sinhalese and *ayitta* in Tamil. Birds on their first arrival on the west coast are much exhausted by their flight, and frequently take shelter in town gardens or even bungalows. Stray specimens occasionally loiter, and have been obtained during the south-west monsoon, but it is not likely to be found breeding in Ceylon.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1.—*Parus major mahrattarum* ; $\times \frac{1}{2}$.

Fig. 2.—*Molpastes hæmorrhous hæmorrhous* ; $\times \frac{1}{2}$.

Fig. 3.—*Dissemurus paradiseus ceylonensis* ; $\times \frac{1}{2}$.

Fig. 4.—*Lanius schach erythronotus* ; $\times \frac{1}{2}$.

Fig. 5.—*Eulabes ptilogenys* ; $\times \frac{1}{2}$.

Plate II.

Fig. 1.—*Acridotheres tristis melanosternus* ; $\times \frac{1}{2}$.

Fig. 2.—*Merula kinnisi* ; $\times \frac{1}{2}$.

Fig. 3.—*Munia malacca* ; $\times \frac{1}{2}$.

Fig. 4.—*Alauda gulgula australis* ; $\times \frac{1}{2}$.

Fig. 5.—*Zosterops ceylonensis* ; $\times \frac{1}{2}$.



FIG. 1.

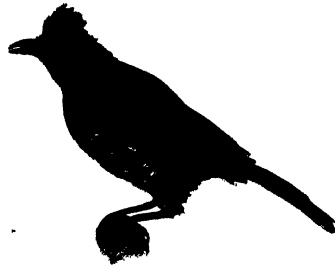


FIG. 2.



FIG. 3.

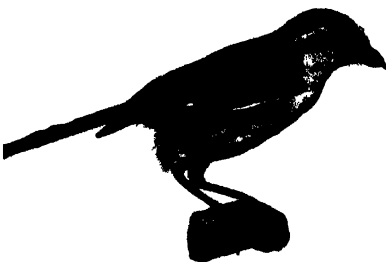


FIG. 4.



FIG. 5.

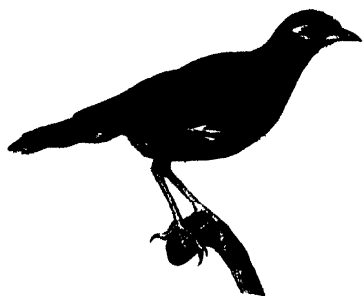


FIG. 1.

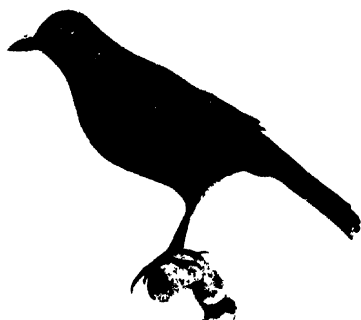


FIG. 2.

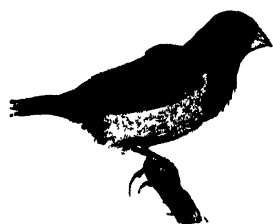


FIG. 3.

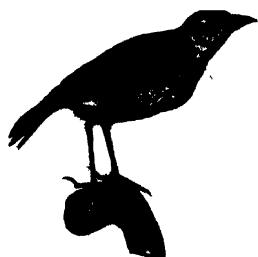


FIG. 4.

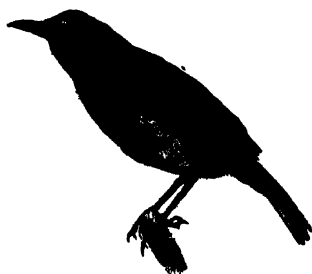


FIG. 5.

NEW CEYLON DIPTERA.

(Part II.)

By R. A. SENIOR-WHITE, F.E.S.

Mycetophilidae.**CEROPLATUS PULCHERPENNIS, sp. n.**

Male.—Head: Dark brown, palpi concolorous. Eyes widely separated below antennæ. Antennæ unicolorous, yellowish-brown, quite as flattened as in *C. quadripunctatus*, but with apical joint much more pointed.

Thorax: Yellowish-brown dorsally, a pair of ill-defined darker lines dorso-centrally converging posteriorly. Shoulders and pleuræ, whitish. Scutellum concolorous with dorsum, metanotum grayish-yellow. Sides of thoracic dorsum and scutellar margin with black bristles.

Abdomen: Grayish-brown, first segment half the width of the rest of the abdomen. Junctions and central area of dorsal surface of segments broadly paler, the whole with bristly black hairs. Genitalia, black, small.

Wings: Grayish, a darker area is bounded internally by a line from axillary angle over the cross veins, sharply angled outwards in upper half of marginal cell to costa, and contains a pale area between the third and upper branch of fifth veins centred over the inner third of petiole of fourth vein, and indefinite pale submarginal spots in second, third, and fourth posterior cells. The infuscation is most pronounced above upper branch of fifth vein internally to pale area in outer three-quarters of marginal and in submarginal cells. Halteres with pale yellow stem and large black capitellum.

Long: 2 mm.

Described from a unique male in good condition taken from a spider's web, Suduganga, Matale, Ceylon, February 17, 1920.

In my own collection.

It is a curious coincidence that the types of both the Asiatic species have come from spiders' webs, as also my only specimen of *C. quadripunctatus* (Brun.).

PLATYURA MINUTA, sp. n.

Male.—Head: Frons very dark brown, the lateral ocelli prominent, whitish. Palpi concolorous. Antennæ paler brown, considerably pubescent, apical joint appearing like a narrow acuminate tip to penultimate.

Thorax: Dark brown, unmarked, shoulders pale yellow. Pleuræ and scutellum slightly paler, metanotum dark, very steep. A row of dorsocentral bristles, sides of dorsum bristly, and some bristles on scutellar margin, all black.

Abdomen: Brownish, unmarked, bristly. Genitalia prominent, a pair of rather paler brownish two-jointed claspers, the basal joint broadened apically and rather longer than apical joint. Between the claspers can be seen a black plate with bifid apex.

Legs: Yellowish-brown, posterior coxæ darker.

Wings: Gray. Petiole of fourth vein nearly as long as its branches, base of upper branch of fifth vein evanescent. Halteres with yellow stem and darker capitellum.

Long: $1\frac{3}{4}$ mm.

Described from unique male taken on window, Suduganga, Matale, Ceylon, April 25, 1920.

In my own collection.

This species runs down to couplet 8 in Brunetti's Key to the Indian species in "Fauna India, Diptera Nemocera," and there separates on the unbanded abdomen.

LYGISTORRHINA ASIATICA, sp. n.

Male.—Head: Frons blackish, with pale hairs, ocelli yellow, distinct. Proboscis as long as hind femur, tubular, brownish-yellow, with short sparse pubescence. Palpi very small,

single-jointed, concolorous. Antennæ laterally compressed, of same width throughout, the apical joint about twice as long as the penultimate, brown, with pale pubescence on underside and longer hairs above.

Thorax: Very dark brown, scutellum and metanotum concolorous, pleuræ yellowish, metapleuræ meeting above as a fine yellow band at junction of metanotum with abdomen, thus sharply separating these two dark portions. Prothorax and humeri, viewed from above, appear as a yellow anterior margin to mesonotum. Thoracic dorsum with irregularly placed stiff black hairs, strongest on lateral and posterior margins, scutellum with a marginal row of hairs.

Abdomen: Black, dorsally and laterally, with bristly hairs throughout, also ventrally from middle of fourth segment to apex. Genitalia inconspicuous, black, with some hairs.

Legs: Coxæ and femora yellowish, fore coxæ and all trochanters darker, as are also all tibiæ and tarsi. Hind tibiæ with the apical spurs equal, and a row of short lateral spines.

Wings: Pale smoky-yellow. Subcosta ending in costa, which extends practically to apex of wing. Halteres with yellow stem and blackish capitellum.

Long : $2\frac{1}{2}$ mm.

Described from a unique male taken on window, Suduganga, Matale, Ceylon, on April 20, 1920.

Type in my own collection.

This species differs from Skuse's definition of his genus in several respects, viz., the palpi are undoubtedly present, Skuse stating "apparently absent." The antennæ are broader and of equal width throughout, but this may be a sexual difference, as Skuse's type is a female; the short lateral spines on the hind tibiæ are easily overlooked, but in my species are undoubtedly present. The terminations of the costal and sub-costal veins also differ, but I do not think that all or any of these differences requires the erection of a new genus.

RHYMOSIA VARICORNIS, sp. n.

Female.—Head: Frons yellowish, with decumbent fine black hairs. A row of black bristles around, but separated from, posterior orbits, the intervening space without hairs and thus appearing as a paler margin to the eyes. All three ocelli surrounded by a small blackish area. Face yellowish, palpi and proboscis rather more brownish. Eyes microscopically pale pubescent. Antennæ sixteen jointed. Scapal joints yellow, each with a ring of black setulæ apically, with two or three longer setæ above and below on first and above only on second joint. First four flagellar joints smooth, yellow, cylindrical, the first one and a half times as long as the second, constricted on basal third; the next three equal, closely sessile. The remaining ten joints laterally compressed, dark brownish, pale pubescent; the first nine sub-equal, the apical half as long again as the penultimate.

Thorax: Yellowish, a pair of purplish-brown stripes from above the humeri widely separated anteriorly, converging posteriorly, enclosing a median V-shaped yellow area, with its apex above root of scutellum. Viewed from behind it is seen that the extreme posterior portion of the mesonotum, too steep to be viewed from above, is all yellow. Within the V-mark are a pair of ill-defined purplish brown lines, converging and terminating at about centre of mesonotum. Humeri and pleuræ yellow. Scutellum yellow, the whole of the dorsal surface, except a narrow median area, brown, as if the mesonotal sub-dorsal brown bands were continued on to it. Metanotum brownish-yellow. Mesonotum short black-haired, a line of sub-erect black bristles along each margin of the V-mark, ending posteriorly in a pair of diverging black bristles medianly above root of scutellum. Several strong black bristles around humeri, those above the calli more or less erect, two very strong ones below decumbent, and one or two strong bristles supra-alar and on postalar calli. A strong apical pair on scutellum.

Abdomen: Strongly laterally compressed, brownish-yellow, dorsum all black, except at base of first and second segments; second to fifth segments laterally with broad posterior black bands. Venter and genital lamellæ yellow.

Legs : Coxæ and femora yellow, tibiæ slightly and tarsi much darker.

Wings : Yellowish-gray. Fork of fifth vein very narrow to beyond level of the fork of the fourth vein; sixth vein strong, extending as far as level of fork of fourth; seventh distinct, incomplete. Halteres yellow.

Long : 4 mm.

Described from unique female, in perfect condition, taken on window, Suduganga, Matale, Ceylon, August 1, 1920.

Type in my own collection.

DELOPSIS NIGRO-FLAVA, sp. n.

Female.—Head : Yellow, with paler pubescence. Antennæ and palpi concolorous. Eyes microscopically pale pubescent.

Thorax : Yellow, the dorsum with the posterior half or three-quarters with a broad black saddle-like patch of irregular outline, leaving only a narrow posterior yellow margin. Propleura yellow, remainder of sides of thorax brownish, hypopleura very dark to black. Scutellum and metanotum black.

Thorax with yellowish hairs and strong brownish-yellow bristles, situated as follows :—A long one on postalar calli, a prescutellar pair, several below wing roots, and about four on margin of scutellum.

Abdomen : Yellow. The dorsum of the first five segments from all black to black with yellow basal halves to third to fifth segments. The black colour more or less extended to lateral on posterior margins of segments.

Legs : yellow, paler than head and thorax, the tip of front coxæ usually more or less darkened.

Wings : Grayish, more yellow on fore border, veins yellowish. Halteres yellow.

Long : 3 mm.

Described from four specimens from Maskeliya in January and March and Matale in January (both Ceylon). Type from Suduganga, Matale, on window, January 29, 1920. Type and other specimens in my own collection.

DELOPSIS SETOSIVENTRIS, sp. n.

Female.—Head, palpi, and antennæ : Yellow, distal flagellar joints of last somewhat darker.

Thorax : Yellowish, an indefinite brown patch on posterior half of dorsum, pleuræ concolorous, slightly darker posteriorly, hypopleuræ very dark to black. Scutellum and metanotum very dark brown. Bristles of thorax yellow-brown, a single postalar, four prescutellar (two acrostichal, two dorsocentral), a few below wing roots, and four scutellar.

Abdomen : Dorsum brownish, extreme bases of segments very narrowly paler, posterior two-thirds of each segment occupied by an ill-defined blackish band. Sides and venter more yellowish, unmarked. On midline of venter, just before apex of second segment, a pair of straight decumbent hairs about as long as mid tarsal setæ, with a shorter, finer pair, slightly posteriorly directed, just posterior to the first pair.

Legs : Pale yellow, unmarked, the hind tibiæ with only two ranges of setæ.

Wings : Yellowish, also veins. Halteres pale yellow.

Long : $2\frac{3}{4}$ mm.

Described from two females taken in garden, Suduganga, Matale, Ceylon, on January 16 (type) and 23, 1920.

Both in my own collection.

The absence of the third row of hind tibial setæ, though contrary to a generic character, I am not prepared to make the cause of a new genus, as so few species are yet known.

DELOPSIS PECTENIPES, sp. n.

Male.—Head, palpi, and antennæ : Yellowish, the first with pale yellow pubescence, the last with flagellar joints rather darker with pale pubescence.

Thorax : Yellowish, an elliptical black spot medianly on anterior third of dorsum, not reaching front margin, continued posteriorly as a black stripe to hind margin. On each side

an admedian black stripe, broader than the median, inclined obliquely so as to coalesce with the latter on posterior third, terminating anteriorly before the level of the median spot, and incised on outer edge at level of wing roots. Pleuræ concolorous with dorsum, slightly darker posteriorly. Scutellum and metanotum black. Bristles dark brown, a postalar, acrostichal and dorsocentral prescutellar pairs, a vertical row of four on hind margin of mesopleuron, one or two on lower edge of pteropleuron and four scutellar.

Abdomen : Yellowish with paler hairs. Dorsum of first five segments gray. A pair of very small genital lamellæ are just visible.

Legs : Pale yellow, unmarked. Hind tibiæ with only two ranges of spines, but on inner side apically there is a comb-like fan of short spines set so closely together as to appear like a plate with dentate margin.

Wings and veins : Yellowish. Halteres paler yellow.

Long : $2\frac{1}{2}$ mm.

Described from unique male in perfect condition taken on window, Suduganga, Matale, Ceylon, on April 19, 1920.

In my own collection.

DELOPSIS FERRUGINEA, sp. n.

Male.—Head : Yellowish-brown with paler hairs. Palpi and antennæ concolorous.

Thorax : Ferrugineous, pleuræ concolorous, scutellum with ferrugineous centre and black sides. A row of stiff yellow hairs along hind margin of dorsum and a covering of same on scutellum. Bristles brownish, a prescutellar row of six, a vertical row of five on hind margin of mesopleuron, four or five pteropleural, and four scutellar.

Abdomen : Yellow with paler hairs. Hind margin of first segment narrowly, of second to fifth broadly black, the bands extending laterally to edge of venter. Sixth segment wholly yellow. Genital lamellæ (mostly concealed) yellow.

Legs: Pale yellow. Upper edge of fore coxæ, lower edge of mid femora, and upper edges and tips of posterior tibiæ infuscated. Hind tibiæ with a small apical comb on inner side.

Wings: Yellowish-grey, the first basal, and that portion of the subcostal cell above it, infuscated. Halteres pale yellow.

Long: $3\frac{1}{2}$ mm.

Described from a unique male in perfect condition taken on window, Suduganga, Matale, Ceylon, on December 19, 1919.

In my own collection.

DELOPSIS FLAVOHIRTA, sp. n.

Male.—**Head:** Brownish-yellow, with pale yellow hairs. Palpi yellowish. Antennæ: scape yellow, flagellum brown.

Thorax: Blackish, yellow on fore margin, humeri, and obscurely on posterior corners of dorsum, the whole with stiff yellow hairs. Pleuræ and scutellum concolorous, with similar hairs. The usual six prescutellar bristles, two or three below humeri, a vertical row on posterior margin of mesopleuron, two or three pteropleural, and four scutellar, all brown.

Abdomen: Black with stiff pale yellow hairs, which are so thick at bases of second to fifth segments as to form distinct pale bands dorsally and laterally. Two brownish genital lamellæ, downwardly directed, are visible.

Legs: Pale yellow. Tips of all coxæ, of posterior femora and tibiæ, infuscated. A small apical comb on inner side of hind tibia.

Wings: Yellowish-gray, darker on foreborder basally. Halteres pale yellow.

Long: 3 mm.

Described from unique male in perfect condition taken on window, Suduganga, Matale, Ceylon, July 6, 1920.

In my own collection.

Bombyliidae.**BOMBYLIUS BRUNETTI, sp. n.**

Male, Female.—Head : In male nearly as broad as thorax, eyes black, contiguous for about half the distance from vertex to antennæ, upper facets considerably larger than lower, the line of division, which is not very clearly marked, occurring at about level of antennæ. Vertex distinct, elevated, ocellar triangle with long black hairs. Face black, shining, a patch of white scales at sides just above antennæ and another at level of mouth margin, which is dark brown. Sides of face and mouth with long black hairs. Antennæ cylindrical, third joint nearly as long as first and second together, the first joint with long black hairs. Palpi black with long hairs. Occiput black with narrow golden scales and long golden hairs mixed above with a few black ones.

In female the frons anteriorly nearly one-third width of head, narrowed by about one-third of this at vertex, black, with golden hair-like scales and some long black hairs, of which there is also a bunch on ocellar triangle. Face shining black, with patches of white scales and black hairs at sides as in male. Antennæ and palpi as in male, but some of hairs of latter, and those along mouth margin, are pale. Occipital hairs stouter, and all golden.

Thorax : Deep black in both sexes, with scattered golden hair-like scales thicker on anterior dorsal area and on pleuræ, the anterior third of dorsum with upright black hairs intermixed, stronger and more numerous in male. Above and in front of wing roots, and on mesopleuræ, a patch of white scales. Metapleuræ with a bunch of golden hairs. Some long black bristles on postalar calli, and on scutellar margin. Scutellum similar to mesonotum, but with the golden hair-like scales thicker around margin.

In female, in addition, there is a thin dusting of heliotrope flat scales behind wing roots and on disc of scutellum.

Abdomen : In male black, first segment with a big tuft of golden scales laterally, and a fringe of short golden scales

towards posterior margin. Second and third segments with black scales and posterior marginal bands of short golden scales apparently not extending to median area, and with thin patches of heliotrope scales laterally on anterior halves of the segments. Fourth to seventh segments covered with snow-white broad appressed scales, hind margins of each segment with a few long black hairs laterally. Venter black, with some golden hairs on posterior margins of segments and thin patches of heliotrope scales thicker towards sides than towards mid line. Genitalia concealed.

Female.—Abdomen: Black, a bunch of golden hairs on anterior margin laterally, posterior margins of first six segments with bands of golden hairs extending right across the dorsal surface, some black scales on the middle line of anterior half of second segment, the remainder dusted with flat heliotrope scales. Seventh segment black, with few heliotrope scales and no golden hairs, apically with many long black bristles. Posterior corners of each segment with a few long black hairs. A lateral spot of flat white scales on anterior margin of second and fourth segments. Venter as in male. Genitalia consist of an ovipositor, which has on each side a row of stiff, short, dark golden spines or bristles, outward and downward directed, the whole surrounded with a thick tuft of red-brown hairs, with some lateral paler, longer ones, which bend inwards apically to cover the whole.

[In no specimen of either sex is the abdomen entirely un-rubbed.]

Legs: Black, thinly covered with appressed bluish scales so as to appear grey. Hind femora with a single row of black bristles below. All tibiae bristly.

Wings: Deep smoky brownish-black, rather paler posteriorly, a black spot in upper corner of second basal cell, over first section of upper branch of fifth vein, and a black streak in extreme base of discal cell, the last two markings not easily visible in the darker specimens. The centre of all the cells with paler streaks, not always, but sometimes very noticeable. Halteres with brown stem and black capitellum.

Long: 4–7½ mm.

Described from eighteen males and twenty-one females from Matale, Opalgalla (intermediate dry zone), Habarana, Kanthalai, and Trincomalee (all Ceylon) in March, April, September, and October of various years. Type male from Trincomalee, October 8, 1919; type female from between Tamblegam and Trincomalee, October 6, 1919.

It was very common along the track from Opalgalla Village to the ford across the Ambanganga on two days in April, 1919.

This species is closely allied to *B. vulpii* (Brun.), but is easily distinguishable from it by the second thoracic white spot beneath the wings, the smaller extent of the male abdomen covered with white scales, and the entire absence of the fiery red scales of the female abdomen of the latter. Both species may occur together, as I took a solitary male of each species on Sober Island, Trincomalee, on October 9, 1919, but, so far as my Ceylon experience goes, the present species is by far the more common of the two. They are without a doubt the two most beautiful members of the genus in Peninsular India, and as the first commemorates the great Entomologist who laid the foundations of the modern study of Oriental Diptera, I feel I cannot do better than dedicate the present species to his successor, who, on van der Wulp's foundation, has raised the edifice of our present knowledge of the Indian dipterous fauna.

Scenopinidae.

SCENOPINUS ZEYLANICUS, sp. n.

Male, Female.—Head: Black, in male the frons consists of an elevated ocellar triangle, from which runs a shining black line, separating the eyes, for over half its length, then gradually widening out to face. Mouth margin, face, and lowest part of frons as far as the junction of the upper and lower eye facets with white side margins. Antennæ dark brown, with pale pubescence visible in certain lights, third joint ligulate, $2\frac{1}{2}$ times as long as first and second together. Eyes over rather more than half their height with upper facets enlarged.

In female, frons about one-ninth of head width, with sides almost parallel throughout, except towards vertex, where it is somewhat widened to enclose the elevated ocellar triangle.

Sides and an impressed middle line smooth shining black, the remainder concolorous, roughened by transverse striations, with some very minute white pile visible in certain lights. Eye facets uniform in size. The white margin to mouth, face, and frons arising up latter about as far as in male. Otherwise as in male.

Thorax: In both sexes similar. Black, rugose, pleurae and scutellum concolorous. Viewed from side, the humerus is surrounded by a fine line of white pubescence, which, broadened, runs inwards along anterior margin, but does not meet from each side on middle line. A small shining brown spot on posterior edge of humerus at commencement of suture.

Abdomen: Black. In male the third to fifth segments dorsally with white bands, that on third narrow, occupying only posterior margin, running almost from side to side of segment, on fourth and fifth much broader, occupying nearly the whole breadth of segment towards middle, but laterally narrowed anteriorly, thus making the shape elongate lunulate. The bands not extending quite so far towards the sides as on third segment. Genitalia large, black.

In female abdomen all black, the third to fifth segments with a median dorsal transverse impressed line.

Legs: Similar in both sexes. Femora and tibiae dark brown, junction of mid femur and tibia paler. Tarsi whitish-yellow, slightly darkened at tip of each joint. Hind femora basally incrassate, hind tibiae simple. The only noticeable pubescence is a fringe of hairs on mid femora.

Wings: Grayish, veins brownish. First posterior cell noticeably narrowed in margin. Lower branch of fourth vein usually not reaching margin, but anal vein does so. Halteres dull brown.

Long: Male, $3\frac{1}{2}$ mm. ; female, 3-4 mm.

Described from a single male and eleven females, all taken on windows at Suduganga, Matale District, Ceylon, in months of January-March and May-August in various years. Type male on June 7, 1920; type female on July 18, 1920.

Types and other specimens in my own collection.

POLYZOA IN THE COLOMBO WATERWORKS.

By N. ANNANDALE, D.Sc., B.A., F.R.S.E., C.M.Z.S.

IN the whole of the animal kingdom there are few groups less frequently associated with the activities of men than the Polyzoa, or, as some prefer to call them, the Bryozoa. Indeed, I know of only one point at which contact is commonly established, namely, the trouble caused in waterworks by the rapid proliferation and accumulation of the colonies of these animals. Numerous instances of this occurrence have now been reported from both Europe and Asia. Some years ago Harmer* collected and collated all the information then available as to European instances with much additional information of his own. When in Japan in 1915 I was shown specimens of a Polyzoon that was causing inconvenience in the pipes conveying the water of Lake Biwa to the city of Kyoto, and Dr. H. H. Marshall has recently submitted to me for identification masses of another species from the waterworks of Rangoon. Still more recently I have received through Mr. R. Kirkpatrick of the British and Dr. J. Pearson of the Colombo Museums examples of yet another species from the Colombo Waterworks.

The damage done by the Polyzoa is both direct and indirect. Their rapid growth tends to block up the pipes, their decay contaminates the water, and their moss-like colonies provide a suitable nidus for many other organisms, such as algæ, protozoa, sponges, minute worms of several kinds, insect larvæ, and even molluscs, which by their vital activities produce discolouration and bad odour in the water. In many cases several different kinds of Polyzoa are present together in the pipes, but in those I have seen in Asia there has been only one species. In Japan it was a *Paludicella*, in Rangoon the cosmopolitan *Plumatella emarginata* (phase *benedeni*), and in Ceylon *P. longigemmis*, a form described by myself from Peninsular India.

* "The Polyzoa of Waterworks," *Proc. Zool. Soc., London*, 1913; pp. 426-457.

PLUMATELLA (HYALINELLA) LONGIGEMMIS Annandale.

1915: *Plumatella punctata* var. *longigemmis*, Annandale, *Rec. Ind. Mus.*, XI., pp. 166, 168, fig. 2, pl. iii., fig. 2.

1919: *Plumatella (Hyalinella) longigemmis*, *id.*, *ibid.*, XVIII., p. 94.

The original specimens of this species were found adhering to rocks in a small pond of slightly brackish water on an island in the Chilka Lake on the east coast of India. Until its discovery in the Colombo Waterworks it had not been found anywhere else.

The comparatively small samples sent me from Colombo look at first sight very different from the type specimen with which I have compared them. The latter is adherent throughout, and its component parts are relatively short and stout and flattened where in contact with the stone to which it is attached. The former seem to have floated free in the water, and were probably attached only at the base of the colony, which consists of elongate, slender, cylindrical stems and branches, more or less entangled together, and forming masses comparable to those formed by many filamentous algæ. The internal structure of the different examples is, however, the same, and the shape and proportions of the statoblasts (resting buds) is practically identical—a very important specific character in *Plumatella*.

In the masses of this species from the Colombo Waterworks I find numerous specimens of more than one species of Oligochaete worms, and also larvæ of the Culicid genus *Chaoborus*. The colonies themselves are covered with Vorticellid protozoa.

The fact that *P. longigemmis* has been found in slightly brackish water is, perhaps, of some practical importance, as Harmer recommends a weak solution of common salt as a destructive agent for Polyzoa in waterworks.

Mode of Occurrence.

Dr. L. F. Hirst, Bacteriologist to the Colombo Municipality, writes as follows :—

“ Colombo is supplied with water from an artificial lake, 28 miles from the city. Prior to the installation of the mechanical

filters at Labugama in 1917, large masses of Polyzoa were constantly observed coming over the spill into the Maligakanda service reservoir. I forwarded specimens to Dr. S. F. Harmer in 1915. He identified them as *Fredericella indica* (Annandale). Only small fragments of Polyzoa and their statoblasts are now found in this water. On April 17, 1920, the level of Labugama Lake rose suddenly after heavy rain from an exceptionally low mark. Considerable quantities of Polyzoon moss appeared in the water on that particular day and were carried on to the filters. This appearance has never been observed either before or since that date. I forwarded specimens taken from the surface of the filters to the British Museum. Sir Sydney Harmer being unable to identify them from Museum types forwarded them to Dr. Annandale. Another piece of the same preserved material was sent direct to Dr. Annandale from Colombo. In August, 1920, a similar Polyzoon, in a partial state of decomposition, was removed from the walls of the wash-water tank at the filtration works. This ferro-concrete tank is uncovered, partially exposed to sunlight, and about 3 feet deep. Fresh filtered water is pumped through it daily. The Polyzoa formed a continuous coating below the water level. The growth had developed in a period of seven months."

NOTES.

*A new Arhopala (Lep: Lycænidæ) from Ceylon.**—In a small collection of *Lycænidæ* recently received from Mr. W. Ormiston from Ceylon there is, amongst other interesting forms, a pair of an *Arhopala*, which Mr. Ormiston considered new. After a fairly careful search I have been unable to find any published description with which it agrees, and have therefore come to the same conclusion. In such a well-worked country as Ceylon, one would hardly have expected such a distinctive species of this showy genus to have been overlooked so long. Its discovery therefore may, I hope, be an earnest of many more yet to be made known.

Arhopala ormistoni, sp. n.

Arhopala, sp. nov., Ormiston, "Notes on Ceylon Butterflies," Vol. XI., Part 40, Part I., p. 58, in "Spolia Zeylanica," 1918.

♂. *Upper Side*.—*Both wings* uniformly deep rich violet-blue. *Fore-wing* with costa and hind margin narrowly black, widest at apex; *hind-wing* with costa and inner margin broadly, hind margin narrowly, dark brown.

Under Side.—*Fore-wing*: Ground colour light gray-brown with a faint vinous tinge, areas 1a, 1b, and 2 centrally and for the greater part very pale shiny gray-brown, cell and remainder of wing surface thickly sprinkled with gray; a small circular spot near base of cell, a larger oval spot in centre, and a still larger one at end of cell, all much darker brown and ringed with white; a discal band of six similar subquadrate spots, interrupted at vein 4, the lowest (in area 1b) very indistinct, a similar oblong spot at base of area 2 lying along vein 2, an indistinct oblong pale brown mark in 1b just before base of vein 2 and in line with central cell spot. A submarginal row of brown lunules edged both sides with whitish, largest and most distinct posteriorly. There are indications of two small

* Reprinted from "The Entomologist," Vol. LIII, p. 97, May, 1920.

costal spots, similar to the cell spots, in areas 9 and 10. *Hind-wing*: ground colour similar, but, together with the markings, almost entirely obscured by very heavy ashy-gray scaling. The most distinct markings are the three small dark brown white-ringed basal spots in the cell and areas 1c and 7, the larger one in centre of cell, the triangular one in centre of 7, and the two squarish ones in 6 and 7, these last being the uppermost spots of the discal band. The remainder of the discal band is represented very obscurely by the outer edge of the spots only, forming a very much broken wavy semi-circular row of short curved dark lines. There is the outline of a long oval spot across cell end, and indications of three or four small spots between it and the inner margin. A small black spot is present at the anal angle, and another just to side of base of tail in area 2, both bordered proximally with metallic blue scaling, which is also present marginally in two small patches between these spots.

Head dark brown with a small white spot between the antennæ; the eyes, except dorsally, ringed with white; palpi white, the third joint and half the second dorsally and laterally only, brown. Thorax, above, covered with longish bronze-green hairs; below, white. Body dark brown, ventrally pale-buffish.

♀. Both wings above uniformly dark smoky-brown, with no trace of blue or bluish reflections. Otherwise exactly similar to the ♂.

Length of fore-wing, ♂ 2.0 cm., ♀ 1.9 cm.

B.M. Types No. Rh. 061 (♂) and 062 (♀) from Nakiadeniya, 16 miles from Galle, South Ceylon, IV., 17, W. Ormiston.

Several other specimens in Coll. Ormiston.

This species seems to be nearest to *A. alitæus*, Hew., and *A. mirabella*, Doherty, but it can at once be separated from any Indian *Arhopala* known to me by its ashy-gray underside and plain brown female.

Natural History Museum,
South Kensington, March 12, 1920.

N. D. RILEY.

A LIST OF LEPIDOPTERA NOTED TO
ATTACK CULTIVATED PLANTS
IN CEYLON.*

NYMPHALIDÆ.

- NEPTIS EURYNOME. *Canavalia gladiata*, *Vigna catjang*
MELANTIS ISMENE. *Sorghum*, *Panicum maximum*.
DANAIS PLEXIPPUS. *Stephanotis* sp.
(U. R. 3.) *Ficus parasitica*, *Carissa carandas*.†
TELCHINIA VIOLEÆ. *Passiflora foetida*.

. PAPILIONIDÆ.

- PAPILIO DEMOLEUS. *Citrus* spp., *Feronia elephantum*.
PAPILIO AGAMEMNON. *Anona muricata*.
PAPILIO PAMMON. *Citrus* spp., *Murraya kœnigii*.
PAPILIO PARINDA. *Citrus* sp.
PAPILIO ARISTOLOCHIÆ. *Aristolochia* sp.

PIERIDÆ.

- TERIAS HECABE. *Cassia fistula*.

LYCÆNIDÆ.

- CATOCHRYSOPS ONEJUS. *Vigna catjang*.
JAMIDES BOCHUS. *Vigna catjang*.
CHILADES LATUS. *Feronia elephantum*.
SPALGIS EPIUS. *Pseudococcus* sp. on *Solanum* sp.

HESPERIDÆ.

- HESPERIA GALBA. *Hibiscus* sp. (hollyhoek).

* Reprinted from the Report of the Proceedings of the Third Entomological Meeting held at Fusa, 1919.

† Where no name is given the reference is to the cage slip for future identification. This collection, except Sphingidæ and Micro-lepidoptera, is now in the Colombo Museum, (R.S.-W.)

EUPTEROTIDÆ.

EUPTEROTE GEMINATA. *Erythrina indica*, *Theobroma cacao*, *Cajanus indicus*.

SPHINGIDÆ.

RHYNCOLABA ACTEUS. *Calladium* vars.

CHÆROCAMPA THEYLIA (VINACEA).* *Balsamifera impatiens*; very bad in November only.

CHÆROCAMPA THEYLIA.† “*Pach-arisi-pillu*” (Tamil).

NEPHELE HESPERA. *Carissa carandas*.

DEILEPHILA NERII. *Vinca* sp., *Oleander* spp.

ACHERONTIA LACHESIS. *Erythrina indica*, *Solanum melongena*, *Capsicum* spp.

ACHERONTIA STYX. *Solanum melongena*.

HERSE CONVOLVULI. *Vigna catjang*.

NOTODONTIDÆ.

STAUROPUS ALTERNUS. *Cajanus indicus*.

SYNTOMIDÆ.

SYNTOMIS PASSALIS. *Phaseolus vulgaris*, *Capsicum* spp. Kohlrabi, Daisy vars, *Trichosanthes anguina*.

SYNTOMIS OYSSEA. *Ipomœa rubro-cœrulea*.

THYRIDIDÆ.

DYSODIA IGNITA. *Croton aromaticus*.

LASIOCAMPIDÆ.

SUANA CONCOLOR. *Psidium guyava*, *Cajanus indicus*, *Hibiscus rosa-sinensis*.

LIMACODIDÆ.

ALTHA LACTEOLA. *Carissa carandas*.

THOSEA CANA. Rose.

NAROSA CONSPERSA. *Feronia elephantum*.

* The species here referred to as *C. theylia* (vinacea) is presumably *Hippotion rafflesi*. Butl. (See Roths and Jordan, *Revis Sphing.*, p. 755.)—Editor.

† The species here referred to as *C. theylia* is presumably *Hippotion barhavica*, Fab. (vide loc. cit., p. 756). The true *Sphinx theylia* of Linnæus is a South American *Xylophanes*.—Editor, *Entomological Meeting*.

LYMANTRIIDÆ.

DASYCHIRA FUSIFORMIS. *Pelargonium* vars, *Canna* sp., *Citrus* sp., rose, *Vigna catjang*, *C. carandas*, Kohl-rabi, *Solanum melongena*, *Phaseolus mungo*, *Cajanus indicus*, *Antigonon* sp., *Moringa pterygosperma*.

DASYCHIRA DIVISA. Daisy vars, Amaryllid lily.

DASYCHIRA MENDOSA. *Vigna catjang*.

DASYCHIRA HORSFIELDI. *Vigna catjang*.

DASYCHIRA SP. (? *MENDOSA*). *Solanum melongena*, *Citrus* sp., *Acalypha* sp.

LYMANTRIA AMPLA. *Pelargonium* vars, *Theobroma cacao*, *Begonia* sp., *Carissa carandas*, rose, *Quisqualis indica*, *Cajanus indicus*.

ORGYIA POSTICA. *Pelargonium* vars, *Erythrina lithosperma*, *Vigna catjang*, *Canna* sp., *P. gratissima*, *Cajanus indicus*, *Solanum melongena*, mangosteen.

LÆLIA EXCLAMATIONIS. *Canna* sp.

EUPROCTIS SCINTILLANS, Rose, Daisy vars, *Capsicum* sp., *Cajanus indicus*.

EUPROCTIS FRATERNA. *Citrus* sp., *Feronia elephantum*, *Pelargonium* vars, *Solanum melongena*, rose, *Hibiscus rosa-sinensis*.

EUPROCTIS SEMISIGNATA. *Quisqualis indica*.

PSYCHIDÆ.

ACANTHOPSYCHE CANA. *Hevea brasiliensis*.

A. PUNCTIMARGINALIS. Bred on Algæ on bamboo.

(AO. 2.) *Anona muricata*. Failed to rear out. Bad pests.

(PO. 2.) *Antigonon* sp. Failed to rear out. Bad pests.

CLANIA ORAMERI. *Cajanus indicus*.

ARCTIIDÆ.

ESTIGMENE LACTINEA. Onion, kohl-rabi, beet.

PERICALLIA RICIINI. *Solanum melongena*, *Phaseolus vulgaris*, *Colocasia* sp., *Oleander*, kohl-rabi, rose, *Cajanus indicus*, mustard, *Momordica charantia*, *Luffa acutangula*.

PISABA LUCIDALIS. *Carissa carandas*.

SELOA PLAGIOLA. *Solanum melongena*.

NYCTEMERA LAOTICINIA. *Vernonia emeria*. Feeds mainly on seed heads.

NOCTUIDÆ.

GLOTTULA DOMINICA. *Amaryllis* spp.

POLYTELA GLORIOSÆ. *Amaryllis* spp., *Gloriosa superba*.

PLUSIA. (Co. 6). Daisy vars. (? *P. limbirena*).

PLUSIA ORICHALCEA. Kohl-rabi, carrot, *Pimpinella anisum*.

PLUSIA AGRAMMA. *Trichosanthes anguina*.

PLUSIA CHALCYTES. Onion, *Zinnia*, *Solanum melongena*, dahlia.

PLUSIA OBTUSISIGNA. *Coleus* sp.

COSMOPHILA INDICA. *Hibiscus* sp. (hollyhock), *H. rosasinensis*.

ACHÆA MELICERTE. Rose.

OPHIUSA CORONATA. *Quisqualis indica*.

PLOTHEIA NEPHELOTIS. *Solanum melongena*.

CHLORIDEA OBSOLETA. *Pelargonium* vars, *Dianthus* sp., *Canna* sp. *Hibiscus esculentus*.

CHLORIDEA ASSULTA. *Physalis peruviana*.

PRODENIA LITURA. *Solanum lycopersicum*, *S. melongena*, *Capsicum* spp., *Petunia*, onion, cabbage, carrot, beet, *Balsamifera impatiens*, *Zinnia*, *Canna* sp., *Gossypium* sp. (Cambodia), *P. gratissima*, *Dioscorea* sp., *Colocasia* sp., mustard, *Pelargonium* vars, *Hibiscus esculentus*, *Momordica charantia*, *Begonia* vars, *Phaseolus vulgaris*, *Vigna catjang*.

EUBLEMMA OLIVACEA. *Solanum melongena*.

EUBLEMMA SCITULA. Pseudococci on *C. carandas*.

ACONTIA TRANSVERSA. *Hibiscus esculentus*, *Hibiscus* sp. (hollyhock).

EUPLEXIA OPPOSITA. Carrot, Daisy var.

PANILLA ALBOPUNCTATA. *Polyporus zonalis* (hymenium surface only.)

AMYNA SELENAMPHA. *Croton aromaticus*.

HYPENA COGNATA. *Lantana*.

LACERA ALOPE. *Cæsalpinia sappan*.

EARIAS CHROMATARIA. *Hibiscus* sp. (hollyhock).

EARIAS FABIA. *Hibiscus esculentus*.

REMIGIA FRUGALIS. *Panicum maximum*.

(Z. A. 3.) *Hirneola hispidula*.

BEARA DICHROMELLA. *Hibiscus rosa-sinensis*.

GEOMETRIDÆ.

CRASPEDIA FIBULATA. Kohl-rabi, *Petunia*, *Dendrobium macarthisæ*, *Calanthe vestita*, *Pimpinella anisum*, spinach.

CRASPEDIA REMOTATA. *Gnaphalium* sp. "Ponnandey Kirey" (Tam.) garden edging plant.

HYPOSIDRA TALACA. *Salvia* sp., *Peltophorum ferrugineum*, *Canna* sp. *Zinnia* sp., rose, *Solanum melongena*, *Cæsalpinia sappan*, *Vigna catjang*.

GYMNOSCELIS ALBICAUDATA. *Hibiscus* sp. (hollyhock).

THALERA CAUDULARIA. *Antigonon* sp.

BOARMIA ACACIARIA. *Cassia fistula*.

BOARMIA BHURMITRA. *Solanum melongena*, *Capsicum* sp.

PSEUDOTERPNA CHLORA. *Cajanus indicus*.

CIDARIA CINGALA. *Balsamifera impatiens*.

NEMORIA INTEGRNOTA. *Cajanus indicus*.

THALASSODES VERARIA. Rose.

PYRALIDÆ.

HYMENIA FASCIALIS. *Celosia* sp., beet.

HELLULA UNDALIS. Kohl-rabi, turnip, cabbage, mustard.

GLYPHODES BIVITRALIS. *Ficus religiosa*, *F. glomerata*.

GLYPHODES INDICA. *Trichosanthes anguina*, melon vars.

TERASTIA METICULOSALIS. *Erythrina lithosperma*.

SYLEPTA DEROGATA. *Hibiscus esculentus*, *Hibiscus* sp. (hollyhock,) *H. rosa-sinensis*, *Gossypium* sp. (Cambodia).

LEPYRODES GEOMETRALIS. Jasmine.

NEPHOPTERYX MINUTELLA. *Solanum melongena*.

CROCIDOLOMIA BINOTALIS. Kohl-rabi, cabbage, mustard, *Capsicum* sp.

MYELOIS PECTINICORNELLA. *Theobroma cacao*.

EPICROCIS LATERTIALIS. *Beleropone* sp.

PACHYZANCLA ÆGROTALIS. *S. melongena*, *S. indicum*?

NACOLEIA INDICATA. *Anona muricata*.

MARUCA TESTULALIS. *Phaseolus vulgaris* vars.

LEUCINODES ORBONALIS. *Solanum melongena*.

DICHOCROCIS PUNCTIFERALIS. *Sorghum* (in heads).

LYGROPIA QUATERNALIS. "Damunu," Singhalese (? Malvaceæ.)

EUZOPHERA PERTICELLA. *Solanum melongena*.

TINEINA.

PLUTELLA MACULIPENNIS. Turnip, cabbage, mustard.

GELECHIA GOSSYPIELLA. *Gossypium* sp. (Cambodia).

COMOCRITIS PIERIA. *Hevea brasiliensis*.

TORTRICIDÆ.

ADOXOPHYES PRIVATANA. *Cajanus indicus*.

(CO. 4.) Dahlia.

PTEROPHORIDÆ.

SPHENARCHES CAFFER. *Pelargonium* vars, *Theobroma cacao*.

STEGANODACTYLA CONCURSA. *Lantana*, *Passiflora foetida*.

R. SENIOR-WHITE.

STRIDULATION IN THE LEAF-INSECT.

(With one Plate.)

Pulchriphyllium crurifolium, Serv.—Stridulation appears to be little known among the *Phasmidæ*, and I have not been able to find any reference to this phenomenon in the somewhat scanty literature to hand. It is not mentioned in the Cambridge Natural History account of these insects, and therefore the following account of a sound-producing organ in certain species of leaf-insects may be of interest.

The organ in question is situated on the third antennal joint in the female insect. The antennæ in this sex are short, stout structures consisting of nine joints, which can be discriminated into a basal peduncle of three joints and a

"flagellum" of six. The third basal joint is roughly tetrahedral in shape, the apex of the tetrahedron being inserted in the distal cavity of the second joint. The "flagellum" springs from the base of the tetrahedron (which is distal to the insect's head). The medial face of the tetrahedron is the largest, and bears the stridulating apparatus. The two antennæ approach each other (when stridulation is taking place) from their bases, so that these large faces can be apposed, and the two flagella are normally held parallel to each other and nearly touching—projecting in front of the head.

Along the distal half of the dorsal edge of each of these opposing faces, there is a sharp ridge with its edge minutely serrated, and from nearly the distal end of this ridge a curved line of small tubercles, set on a slightly raised mound, runs ventrally and posteriorly almost along the distal and ventral boundaries of the face. Thus, the relation of the sharp ridge to the row of tubercles is almost that of a radius to an arc of its circle. It is hoped that the figures will make this clear.

The act of stridulation is performed by moving the two antennæ respectively up and down (in a dorso-ventral direction), so that the opposing faces of the third joints rub against each other—the ridge of one scraping against the row of tubercles of the other and *vice versâ*. By this means a sound is produced, but it is exceedingly feeble, and one has to hold the insect quite close to the ear in order to hear it at all. The only thing to which I can liken it is (on a very microphonic scale) the sound made by water dripping rapidly, but fairly regularly, from a rain spout on to the surface of an umbrella. As to what purpose it serves in the insect's economy, I am unable to offer any suggestion other than that it is probably designed to frighten possible enemies. It is conceivable that a bird (say) which had by some possibility succeeded in penetrating the insect's disguise and had seized it, might be induced to let go on hearing the weird sound, which would probably sound much louder to a bird, holding the insect in its beak, than it does to us. I am inclined to think, however, that the real enemies of leaf-insects are not birds and lizards, &c., which hunt almost exclusively by sight, but creatures

Fig. 1.

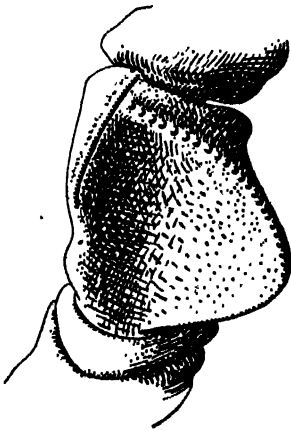
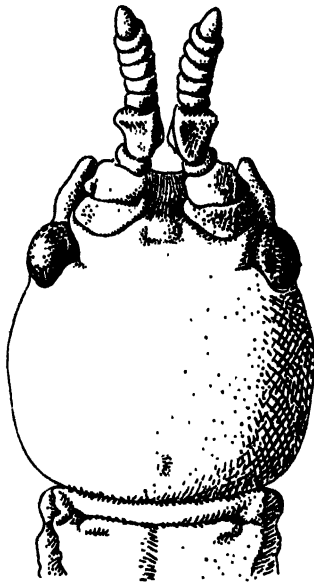


Fig. 2.

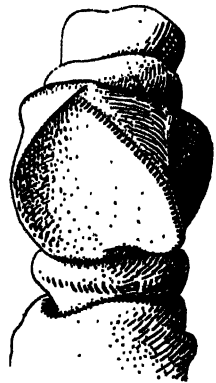


Fig. 3.

Pulchriphyllium crurifolium.

with subtler means of finding their prey, such as red ants. If this be so, the stridulation can hardly be much of a protection. I would like to meet the red ant that could be scared off by a little noisy bluff!

The best way to induce the "music" is to hold the insect by the pro-thorax, when its antennæ will almost certainly be put in action.

The apparatus is well developed even in the newly-hatched nymphs, and they can produce a sound which is just detectable by human ears. Unfortunately there are no male specimens available for examination at the time of writing, but I anticipate that the apparatus will be found to be present in them up to the last nymphal instar, after which the antennæ assume a very different form from those of the female.

The single specimen of *Phyllium athanyus*, Westw., in our collection, clearly shows a similar apparatus, but on a much finer scale than that of *P. crurifolium*. As I have never seen a living specimen of this very rare species, I am unable to describe its musical powers.

The fact that *P. crurifolium* produces a sound, by means of its antennæ, was first brought to my notice by Mr. C. Solomons, and on examining the antennæ microscopically the curious apparatus described was discovered.

EXPLANATION OF PLATE.

Fig. 1.—Head of *Pulchriphyllium crurifolium*. $\times 5\frac{1}{2}$.

Fig. 2.—Third joint of left antenna of *P. crurifolium*, showing stridulating apparatus. $\times 26$.

Fig. 3.—Third joint of left antenna of *Phyllium athanyus*, showing stridulating apparatus. $\times 26$.

N.B.—In figs. 2 and 3 the dorsal aspect is to the left of the figures.

G. M. HENRY.

PROCEEDINGS OF THE CEYLON NATURAL HISTORY SOCIETY.

Thirty-third General Meeting.

THE Thirty-third General Meeting of the Society was held in the Colombo Museum Reading Room on Friday, November 26, 1920, at 9.15 P.M. The Hon. Sir Graeme Thomson, K.C.B., in the Chair.

A lecture entitled "Our Food from the Waters" was given by Dr. Joseph Pearson, D.Sc., F.R.S.E., F.L.S. Dr. Joseph Pearson explained a number of interesting exhibits.

Thirty-fourth General Meeting.

The Thirty-fourth General Meeting of the Society was held in the Colombo Museum Reading Room on Wednesday, January 12, 1921, at 5.15 P.M. Dr. Joseph Pearson in the Chair.

Forty-three new members were elected.

A paper entitled "Some useful Trees and Plants about Colombo" was given by Mr. Lewis.

Ninth Annual General Meeting.

The Ninth Annual General Meeting of the Society was held in the Colombo Museum Reading Room on Wednesday, March 9, 1921, at 5.15 P.M. Mr. W. E. Wait in the Chair.

The accounts and the reports of the Honorary Secretaries and Treasurers for 1920 were read and confirmed.

The following Office Bearers were elected for the ensuing year :—

Patron.

His Excellency the Governor.

President.

Sir Graeme Thomson, K.C.B.

Vice-Presidents.

F. M. Mackwood, Esq.
W. E. Wait, Esq., M.A.

| Dr. Joseph Pearson, D.Sc.,
| F.R.S.E., F.L.S.

Dr. A. Nell.

Council.

The Ven. F. H. de Winton, M.A.	E. Evans, Esq., B.Sc.
Rev. Father M. J. Le Goc,	E. C. T. Holsinger, Esq.
O.M.I., M.A., B.Sc.	C. T. Symons, Esq., B.A.
W. W. A. Phillips, Esq.	F. Lewis, Esq.

Honorary Secretary and Treasurer.

A. H. Malpas, Esq.

New Members : Mrs. J. Kubli and Messrs. Dennis Wood and W. W. Beling.

Mr. G. M. Henry exhibited some interesting specimens of insects, which he explained in detail.

Dr. Joseph Pearson exhibited and explained specimens of mother-of-pearl.

Thirty-sixth General Meeting.

The Thirty-sixth General Meeting of the Society was held in the Colombo Museum Reading Room on Tuesday, May 31, 1921, at 5.15 P.M. Dr. Joseph Pearson in the Chair.

New Members : Miss U. P. Buckmaster, Messrs. T. E. Tunnard, J. W. Nagel, and Dr. C. H. O. Senanayaka.

A paper entitled "How to collect Insects" was read by Mr. G. M. Henry. Mr. F. E. Mackwood gave a demonstration of photographs illustrating jungle life.

Mr. Henry explained a collection of interesting exhibits.

DESCRIPTIONS OF SOME NEW CARABIDÆ FROM
CEYLON.

(Part I.)

By H. E. ANDREWES.

THE Colombo Museum having sent me for determination a considerable collection of Carabidæ, it occurred to me, while studying them, that it would be useful to publish a complete Catalogue of all the species known from the Island. As a preliminary to this I am publishing here the descriptions, not only of the new species contained in the Museum collection, but also of such as I have been able to find in the British Museum, the Hope collection at Oxford, and in my own collection. For their kind assistance in placing material at my disposal I have to thank Professor Poulton and Dr. Gahan, and for getting together the Ceylonese specimens in the British Museum I am also indebted to Mr. G. J. Arrow. I have further, through the courtesy of Dr. Gestro and Dr. Horn, been able to examine the Ceylon collections in the Genoa Museum and the German Entomological Museum in Berlin. As a result, I describe in this paper one new genus and twenty-three new species, and in addition I am re-describing the genus *Anomostomus* of Laferté, rather imperfectly characterized by its author, and now recorded for the first time from the East. Many of these new species also occur on the mainland of India, but a fair number, so far as our present knowledge goes, are confined to Ceylon.

Of the species described from the material of the Colombo Museum, I have, at the request of the Director, handed the types of the following to the British Museum:—*Distichus uncinatus*, *Psilus porphyreus*, *Disphæricus myrmex*, *Oodes taprobanæ*, *Oodes xanthochilus*, and *Abacetus henryi*. By his kindness I have been allowed to retain in my own collection the types of *Craspedophorus halyi* and *Euplynes marginatus*. Dr. Horn has also been good enough to allow me to retain the types of *Olivina mustela*, *Gnophodes pearsoni*, and *Microlestes demessus*.

I must not omit to tender my thanks to Dr. Pearson, the Director, and to Mr. G. M. Henry for enabling me to study the interesting collection at Colombo.

COPTOLOBUS LATUS sp. nov.

Length : 16·5—20·0 mm. Width : 4·8—6·3 mm.

Black : antennæ, palpi, and tarsi more or less piceous.

Head (5·0 mm. wide) rather flat, quadrate, with the front corners obliquely truncate, eyes moderately prominent, genæ oblique, projecting very little less than eyes, antennæ reaching base of prothorax, joint 2 a little longer than 3, terminal joints longer than wide, mandibles rather feebly bicarinate above, elongate, curved, right with a broad tooth, left with a deep indentation at middle, and below it a broad tooth, both slightly toothed near apex, front with two shallow, linear, parallel impressions, on the outer side of which are some very vague striæ ; surface smooth and shiny. *Prothorax* transverse (4·0 × 5·75 mm.), convex, apex slightly and widely emarginate, sides and base with narrow reflexed border, though well-marked marginal channel, especially along base, almost circular in shape, with truncated apex, middle of base very slightly flattened, front angles not rounded, but not projecting, no sign of tooth at hind angles, which have completely disappeared, a seta on each side at front angle, and a second one just below it, a third one behind ; median line clearly marked, not reaching extremities, front transverse impression faint, hind one wanting, basal foveæ very small and faint, surface smooth and shiny. *Elytra* (5·75 × 8·50 mm.) moderately convex, with rounded sides, widest at about middle, a narrow reflexed border, which is dilated at shoulder, but hardly forms a tooth, base emarginate ; 8-striate, the striæ fine, with occasional traces of punctures only, not obliterated towards apex, intervals flat on disk, rather convex at sides, especially near shoulder, 3 with four setiferous pores, one not far from base, the other three towards apex, 9 with a series of umbilicate pores and minute, elongate tubercles ; surface smooth, but less shiny than head and prothorax, base tuberculate and rugose. Beneath the body is smooth, the head a little punctate at base.

The species seems intermediate between the two sections of Chaudoir's Monograph, and is about the size and shape of *C. glabriculus* Chaud. From this, it is at once distinguished by the deeper striation of the elytra; genæ less prominent, prothorax narrower, its margin forming a more regular arc, the apex less emarginate, base of elytra, beyond the row of tubercles, to some extent at least, rugose, tubercles of the marginal series larger, more elongate, and closer together.

Ceylon: 5 ex. Type in the British Museum. An example in the Colombo Museum from Bulutota has deeper and distinctly punctured striæ, with the shoulders very obviously dentate; nevertheless, it agrees so well with the typical form in other respects that I think it belongs to the same species. There are two examples from Mr. T. G. Sloane's collection; one of these is unusually smooth and shiny, the legs reddish, the base of the mandibles (which are very widely opened) is yellowish and translucent, the basal tooth in both mandibles very jagged; the second example, labelled "Bilihul-oya (I. Z. Kannegieter)," is smaller than all the other specimens, the shoulders of the elytra are almost dentate, the intervals distinctly convex and the striæ finely punctate.

DISTICHUS UNCINATUS sp. nov.

Length: 12—13 mm. Width: 3.1—3.3 mm.

Black: head and prothorax shiny, elytra dull, shagreened.

Head (3.0 mm. wide) quadrate, anterior angles obliquely out away, frontal impressions linear, fairly deep, divergent behind, a few striæ on each side between them and the eye, neck with a faint and rather finely punctured constriction, clypeus dentate at each side of labrum, mandibles short, carinate, eyes moderately prominent, antennæ reaching base of prothorax, surface minutely and almost imperceptibly punctate. *Prothorax* (2.8 × 3.3 mm.) transverse, convex, base very slightly produced in middle, apex faintly emarginate sides finely bordered, parallel, front angles a little rounded, not prominent, a pore and seta just below them and another at hind angle, which is in the form of a slight and inconspicuous tooth; median line and front transverse impression rather fine, but sharply incised, basal foveæ obsolete, their site

finely rugose, surface (like that of the head) very minutely punctate. *Elytra* (3.3×6.6 mm.) rather flat, nearly parallel, but very slightly dilated behind, a small but distinct hook-like tooth at shoulder; very finely striate, the striae finely punctate (very much as in *Scarites punctum* Wied.), intervals flat, slightly convex near shoulder, three pores on stria 3, at a fourth, three-fourths, and close to apex, marginal channel finely, base more coarsely rugose.

Beneath the body is smooth in the middle, head punctate, sides and last ventral segment very finely rugose-punctate.

Rather larger than *D. puncticollis* Chaud, the frontal foveae with a well-defined linear impression, head much less punctate, eyes larger, joints of antennae longer; base of prothorax not punctate, but faintly rugose over a very small area; elytra much more finely punctate-striate.

Ceylon: Hambegamuwa, 3 ex. Type in the British Museum; cotypes in the Colombo Museum and in my collection.

CLIVINA MUSTELA sp. nov.

Length: 4.0—4.25 mm. Width: 1.0 mm.

Dark chestnut red, elytra piceous with reddish border and suture, first two joints of antennae, palpi, and tarsi testaceous.

Head smooth, vertex flattened, clypeus finely bordered and faintly emarginate in middle, wings rounded, a little behind median part, and separated from it by a deep notch, on the outer side separated by an equally deep notch from the frontal plates, which are rather small and with outer margin obliquely truncate, suture clearly marked, but not deep, lateral grooves deep in front, rather shallow behind, going straight back to the neck constriction, which is interrupted in middle, mandibles short, eyes prominent, the slightly developed genae meeting the neck behind at a right angle, palpi elongate, slender, antennae moniliform, incrassate. *Prothorax* convex, parallel (though faintly sinuate at apical third), as long as wide and a little wider than head, base strongly bordered, apex truncate, the front angles distant from neck, and projecting a little forwards, sides bordered, a well-marked tooth at hind angles, front transverse impression reaching border, median line very distinct, basal impressions

obsolete, surface smooth. *Elytra* cylindrical, nearly parallel, though very slightly narrowed towards base, hardly wider than prothorax, a little more than twice as long as wide, base truncate; striæ fairly deep, crenulate, 2-6 disappearing just before apex, 5 joining 6; at base 1-4 are free, 6 joins 5, and 7 joins 6 at some little distance from base, intervals smooth, 3 with four very large equidistant setiferous pores, 8 carinate at both extremities. Prosternal process narrow in front. Last ventral segment with two adjacent setæ on each side. Front femora widely dilated, emarginate beneath near apex; front tibiæ not grooved, 4-digitate (including apical prolongation), basal digitation very short; intermediate tibiæ with a long spine at some distance from apex.

Evidently allied to Putzeys' *lobata* group, but smaller than any species described by him, differing also in colour, and in the absence of groove on the front tibiæ.

Ceylon: Anuradhapura (Dr. W. Horn), 2 ex. The type is in my collection; cotype in Deutsch Ent. Mus.

PSILUS PORPHYREUS sp. nov.

Length: 2.3 mm. Width: 0.9 mm.

Dark red, shiny: antennæ, palpi and tarsi testaceous yellow.

Head elongate, eyes not prominent, behind them a slight constriction, neck tumid, labrum short, truncate, clypeus truncate in front, the suture deep, the frontal plates forming small rounded bosses, between which and middle of clypeus are deep furrows, which diverge outwardly behind and are carried round the inner margin of eyes, surface smooth, antennæ moniliform, reaching base of prothorax, pubescent from near base of joint 2, which is considerably longer than the other joints. *Prothorax* very convex, nearly twice as wide as head, and about as long as wide, trapezoidal, narrowed in front, the sides nearly straight, strongly rounded behind and constricted at base, the constriction crenulate, apical furrow deep, carried round front angles and along sides to basal third, where there is a seta, but no tooth, another seta at about apical sixth, median line fine, surface smooth. *Elytra* convex,

a little wider than prothorax, oval, border widened at sides of base, and very slightly dentate behind shoulder, marginal channel carried round to opposite interval 3, apex somewhat excavated at sides, striæ punctate-striate, stria 1 only reaching base and apex, intervals smooth, without pores. The front tibiae end in a long, curved spine, and the intermediate tibiae are without spur.

Much smaller and lighter in colour than *P. trapezicollis* Bates, the head without the side ridges on vertex, maxillary palpi similar in form, but not quite so attenuated, last joint of labial palpi much more dilated in middle, mentum smooth (shagreened in *trapezicollis*), the tooth carinate and apparently projecting a little beyond level of lobes; prothorax similar in shape, but the marginal channel ceases at the hind setiferous pore; elytra with hardly toothed shoulders, striæ much more strongly punctate, apex distinctly excavated at sides.

Ceylon: Kotte, 1 ex. Type in British Museum.

DISPHÆRICUS MYRMEX sp. nov.

Length: 10—11 mm.

Black, shiny: joint 1 of antennæ (rest piceous) and legs dark red (tibiae and femora nearly black in one specimen), palpi light brown.

Head (1.2 mm. wide), elongate, slightly dilated and strongly bordered before the prominent eyes, and deeply constricted behind them, neck tumid, two deep furrows, converging in front, but not meeting and not quite reaching clypeus, just separated behind from two short furrows, one on each side, between eye and vertex, clypeus bisetose, depressed at sides, the middle raised in the form of a rounded boss, labrum small, slightly emarginate, mandibles porrect and strongly toothed, mentum wide, with a sharp tooth in the sinus, palpi setose, last joint securiform, truncate, joint 3 of maxillaries very short, joint 2 of labials bisetose, antennæ thick, not reaching much beyond base of prothorax, setose from middle of joint 3, but apex of 2 with some long setæ, surface smooth and polished, transversely striate beneath. *Prothorax* very convex, oval, longer than wide (2.75×2.40 mm.), declivous and almost

vertical behind, base widely bordered, truncate, apex slightly emarginate, front angles adjoining neck, sides evenly rounded, with a very fine border, a pore and seta at middle, hind angles indistinct, flattened against sides of base; median line very clear and deep, especially behind, where it joins the marginal groove, no transverse impressions or foveæ, surface smooth and polished. *Elytra* convex, oval (3.5×6.0 mm.), pedunculate, shoulders obliterated, sides strongly and evenly rounded, slightly sinuate before apex; suture widened and very deep close to base, no scutellary striae, 9-striate, the striae finely punctate, 1 joins marginal channel in front, but does not quite reach apex, 2 arises and ends independently (but in one specimen it joins 1 in front), 3 arises in an umbilicate pore and joins 4 behind, 5 and 6 join behind, 7 reaches apex, 8 and 9 arise in marginal channel near base, but 9 is only clearly visible behind, the outer striae shorter at both ends than the inner ones, intervals convex, 3 without dorsal pores, 8 with an interrupted row of umbilicate pores, surface smooth and polished. *Sterna* smooth and polished, prosternum channelled, metasternum with a deep rounded depression in middle, its episterna very small, as long as wide. *Venter* deeply sulcate and depressed at sides, surface smooth, the segments each with a single setiferous pore, apical segment ♂ with two large ones on each side, ♀ with half a dozen on each side, irregularly disposed. *Legs*: front femora clavate, front tibiae arcuate, all the tibiae clothed with golden pubescence towards apex, ♂ four dilated joints to front and middle tarsi, clothed with scales beneath, and densely fringed with long golden hairs at sides, all tarsi hairy above, the hinder pair rather scantily, claws simple.

Considerably larger than *D. ovicollis* Bates, the legs, antennæ, and palpi darker. Head with stouter antennæ, larger eyes, and the last joint of the palpi more strongly dilated; prothorax similar, but the outline of the margin more oblique behind the front angles; elytra with stria 6 well-defined (rudimentary in *ovicollis*), 7 originating nearer the base. Bates' description of the prothorax of his *ovicollis* is very misleading. He says: "The thorax attains its greatest width immediately behind its anterior angles," whereas in fact it is regularly oval, and like the new species, widest at about middle.

Ceylon : Koggala and Veverry, 2 ex. ♂♂. Madras : Anaimalai Hills, Anaipady, 1 ex. ♀. (Agric. Coll. and Res. Inst. Coimbatore). Type in British Museum.

CRASPEDOPHORUS HALYI sp. nov.

Length : 12·0—13·0 mm. Width : 4·9—5·4 mm.

Black, each elytron with two orange-coloured fasciæ : palpi, apical joints of antennæ, and tarsi piceous.

Head small and narrow (2·0 mm. wide), with prominent hemispherical eyes, neck smooth and polished, strongly constricted behind eye, clypeus and labrum smooth, frontal foveæ elongate and fairly deep, surface rugosely punctate, antennæ filiform, slender, nearly reaching middle of elytra, labrum narrow, emarginate, the two middle setæ a little removed from front margin, mandibles hooked at tip, palpi long and slender, mentum very wide, with rounded lobes, a very shallow and open sinus, tooth very short. *Prothorax* moderately convex, transverse ($3\cdot0 \times 4\cdot0$ mm.), much more contracted in front than behind, widest at basal third, extremities truncate, front angles adjoining neck, sides explanate behind, with a fine, hardly appreciable border, strongly dilated, but very little rounded, from apex to basal third, then sharply rounded, and slightly sinuate (both horizontally and vertically) to base, the hind angles in the form of a minute rectangular tooth ; median line clearly marked, foveæ fairly deep, extending to base, the sides of which are very distinctly raised, the whole surface coarsely and a little confluent punctate, the epipleuræ smooth. *Elytra* ($5\cdot4 \times 8\cdot25$ mm.) convex, oval, widest a little behind middle, sides gently rounded, distinctly sinuate near apex ; striæ deep, closely and clearly punctate, intervals convex, finely but not closely punctate, pubescent, the epipleuræ finely asperate ; the front fascia is fairly wide, and extends from the border a little below the shoulder to stria 2, the coloured patch on interval 3 very short the hind fascia rather smaller, a little transverse, from stria 8 to 3. *Sternum* : all the sterna coarsely punctate, metepisterna distinctly longer than wide. *Venter* coarsely

punctate at sides, finely punctate and a little pubescent in middle, the segments distinctly crenulate along front margin. *Legs* : tarsi pilose on both upper and under surfaces.

A little smaller than *C. bifasciatus* Cast. Head with the joints of both antennæ and palpi longer and more slender ; prothorax less convex, sides more explanate and reflexed behind, hind angles with a distinct rectangular tooth ; elytra, with both intervals and striæ more finely punctate, the front and hind fasciæ orange, reaching striæ 2 and 3 respectively (in *bifasciatus* yellow, and reaching striæ 1 and 2). Tarsi hairy beneath.

Ceylon : Niroddumunai, 2 ex. Type in my collection ; cotype in Colombo Museum.

OODES TAPROBANÆ sp. nov.

Length : 9.0—10.0 mm. Width : 3.75—4.2 mm.

Black, iridescent and shiny beneath, above rather dull, the whole surface minutely punctate (as in the genus *Anatrichis*), antennæ, palpi (apex lighter), tibiæ, and tarsi piceous.

Head (1.6 mm. wide) convex, eyes large and moderately prominent, clypeus slightly emarginate, frontal foveæ punctiform, antennæ and palpi slender, latter truncate at apex. *Prothorax* transverse (2.4 × 3.5 mm.), convex, both base and apex widely and slightly emarginate, strongly contracted in front, gradually dilated and evenly rounded to base, which is very slightly wider than base of elytra, a minute (presumably setiferous) pore just inside hind angle on basal margin, angles right, hardly rounded ; median line excessively fine, basal foveæ obsolescent, but visible. *Elytra* (3.75 × 5.2 mm.) moderately convex, elongate-ovate with truncated base, border rather fine, sinuate near apex, shoulders square, minutely toothed ; striæ fine and very finely punctate, not obliterated at sides, 1 and 2 arising from a common umbilicate pore, intervals nearly flat, but a little convex at sides, 8 as wide in middle as the other intervals, convex close to shoulder, narrowed and very convex towards apex, 3 with a pore behind middle and another towards apex.

Prosternal process finely bordered and a little rounded at apex, in front of it a deep oval puncture, metepisterna only a little longer than wide, not sulcate, feebly punctate, sides of ventral surface finely but indistinctly punctate, margin of last segment faintly sinuate, with a single pore and seta on each side ♂, two in ♀, front tarsi ♂ rather widely dilated.

Not unlike *O. peguensis* Bates, but narrower and more regular in outline. Head with more evident and punctiform foveæ, labrum not depressed, clypeus not bordered, palpi more slender; prothorax rather less narrowed in front, basal foveæ obsolete; elytra with interval 8 as wide, for most of its length, as the others, 3 with second puncture nearer apex. The metepisterna are much less coarsely punctate.

Ceylon: Vavuniya, 1 ex. ♂. Anuradhapura (Dr. W. Horn—Deutsch. Ent. Mus.), 1 ex. ♀. Type in the British Museum.

Chaudoir's statement that in the genus *Oodes* there is no setiferous pore at the hind angles of the prothorax is not always true. There is such a pore, though a small one, both in this species and in *O. parallelus* Laf.

ODES XANTHOCHILUS sp. nov.

Length: 8.0 mm.

Black, shiny, strongly iridescent: head, with antennæ and buccal organs, prothorax, a stripe on each elytron on intervals 6-8, curving inwards behind and meeting at apex, and legs testaceous red. The head, above and beneath, middle of prothorax beneath, epipleuræ of elytra, and interval 9 (with marginal channel) to near apex, are darker, almost piceous, the legs a little lighter.

Head (1.5 mm. wide) convex, smooth, eyes large and moderately prominent, clypeus slightly emarginate, frontal foveæ small but distinct, antennæ fully reaching base of prothorax, maxillary palpi rounded at apex, labial palpi wanting. *Prothorax* rather flat, transverse (2.0 × 3.0 mm.), both base and apex widely and slightly emarginate, contracted in front, where apex is hardly wider than head, evenly rounded and dilated to base, which is hardly narrower than elytra, the narrow side border extends some little way on each side

along apical margin, but behind it only just turns the hind angle and ends in a small pore, both front and hind angles slightly rounded, latter about right; median line very fine, basal foveæ small but distinct, surface smooth. *Elytra* (3.2×4.5 mm.) moderately flat, ovate with truncated base, a little pointed behind, border sinuate near apex, shoulders square; striæ deep, very finely crenulate, not obliterated at sides, 1 and 2 arising from a common umbilicate pore, intervals fairly convex, 8 wider and 7 narrower at base than the other intervals, 3 with an almost invisible pore near apex, surface smooth.

Prosternal process bordered and bluntly pointed at apex, metepisterna a little longer than wide, not sulcate, slightly punctate, ventral surface rather vaguely punctate at sides, last segment emarginate and with a single pore and seta on each side, front tarsi ♂ widely dilated.

Widely different in form from any other Eastern *Oodes*, with exceptionally deep striæ (deeper than in *O. rhodopus* Bates), and distinguished at once by its unusual coloration.

Ceylon: Kala-oya river, 1 ex. ♂. In the British Museum.*

PLATYMETOPUS PICTUS sp. nov.

Length: 7.0—8.0 mm. Width: 2.4—2.8 mm.

Piceous beneath, lighter along median line; upper surface dark aeneous, palpi, joints 1–3 of antennæ (rest fuscous), labrum, margins and epipleuræ of prothorax, legs, and a pattern on elytra testaceous. The elytral pattern consists in a broad testaceous stripe on each side, covering intervals 6–8, and extending from base to apex, but more or less interrupted behind middle on 7–8, with an apical patch joining it; the aeneous colour on interval 3 extends nearly to apex, on 4–5 to about a fourth, and on 1–2 to about a sixth from apex; interval 4 is sometimes, and 1–2 more rarely in part testaceous. The body is covered with a short, erect pubescence, leaving the surface moderately shiny.

* A second specimen (♀) has recently been taken Mr. E. A. D'Abreu at Balaghat in the Central Provinces. This is larger and distinctly wider (3.6 mm.) than the ♂; it is also less iridescent. The elytral striæ are not so deep, the intervals wider and flatter; the apical ventral segment has two pores on each side.

Head short, wide, convex, eyes moderately prominent, genæ oblique, surface finely but not closely punctate, antennæ reaching but little beyond base of prothorax. *Prothorax* cordate, convex, transverse, a third as wide again as head, and half as wide again as long, base truncate, apex a little emarginate, sides rounded in front and very slightly sinuate before the rectangular hind angles, the short median line, basal transverse depression and foveæ, all lightly impressed, surface finely punctate, more coarsely along base. *Elytra* moderately convex, nearly parallel, a little wider than prothorax, less than twice as long as wide, shoulders rather square, margin faintly sinuate before apex; punctate-striate, the punctures fine and close together, the surface finely punctate.

A little smaller and much less closely and finely punctate than *P. flavilabris* F. The pattern of the elytra, which almost exactly reproduces that of *P. figuratus* Boh., at once distinguishes the species from all its Eastern congeners.

Ceylon, S. India, N. W. India, also Yemen in Arabia (Millingen—Brit. Mus.). Central India (Gen. Hearsey—Oxford Mus.). United Provinces: Sitapur (H. G. Champion). Bombay: Belgaum dist., Gunji (H. E. Andrewes). Madras: Bellary dist., Yemmiganur and Coimbatore (T. B. Fletcher—Agric. Res. Insts. at Pusa and Coimbatore). Mysore: Bangalore (N. Annandale—Ind. Mus.) and "Mysore" (Dr. T. V. Campbell—E. A. Butler coll.). The type (Mysore) is in my collection.

I have preserved for the species Chaudoir's MS. name.

HYPOLITHUS LIVIDUS sp. nov.

Length: 7·5—9·0 mm. Width: 2·8—3·1 mm.

Under surface black, upper surface very dark iridescent blue, shiny; buccal organs, joints 1-3 of antennæ (rest piceous), and legs testaceous, tibiæ and tarsi a little darker.

Head convex, with large prominent eyes, clypeal suture very faint, lightly depressed at extremities, between which and eyes there is at most only a slight indication of an impressed line, surface finely and faintly punctate. *Prothorax* quadrate, slightly convex, transverse, more contracted in front than behind, half as wide again as head and about a third as wide

again as long, base truncate, apex a little emarginate, sides uniformly rounded, a little explanate towards base, not sinuate behind, hind angles obtuse, moderately rounded, and finely bordered; the usual impressions all lightly marked, surface closely punctate, finely on disk, rather more coarsely and also confluent along base, especially near hind angles. *Elytra* elongate, moderately convex, a little wider than prothorax, and about two-thirds as long again as wide, border sharply angled at shoulder, sides parallel, lightly sinuate near apex; striæ clearly incised, almost imperceptibly crenulate, intervals nearly flat, but convex near apex, odd ones seriatly punctate, the punctures small and numerous, surface very finely and closely punctate. Underside finely but not closely punctate.

Allied to *H. acutangulus* Bates, but more elongate, parallel, and shiny. Head wider, more finely and sparsely punctate, with only a vestige of an impressed line between clypeal suture and eye; prothorax with rounded hind angles, the surface less coarsely punctate along base; elytra longer, more parallel, and much more shiny, the punctures on the surface similar in size, but much more distinct.

Ceylon: Colombo. Central Provinces: Nagpur (E. A. D'Abreu). Bombay: Belgaum (H. E. Andrewes), Surat (H. M. Lefroy), Bombay Town (N. B. Kinnear). Bengal: Calcutta (J. Wood Mason), Chapra (Mackenzie), Muzaffarpur, Sarda (F. W. Champion), Siripur. Bihar: Pusa (T. B. Fletcher), Kierpur and Katihar (C. A. Paiva). United Provinces: Sitapur (H. G. Champion), Lucknow (E. A. D'Abreu), Hurdwar and Roorkee (J. Wood Mason). Punjab: Rawalpindi (R. Hodgart). The type (Nagpur) is in my collection.

ANOMOSTOMUS Laferté Rev. et Mag. Zool. 1853. 376.

Head large, very wide, convex, extending forwards very little beyond eyes, neck inflated, gula with a large setiferous pore on each side, close to buccal fissure; eyes large, but not prominent, not far removed from buccal fissure, a single supra-orbital seta; clypeus short, deeply emarginated in a regular arc in front and bordered, exposing the basal membrane of the labrum, bisetose at front angles, the suture with

a fine pore behind each extremity, which is carried forward, not backward towards eye ; labrum small, narrow, sex-setose, emarginate, with rounded angles ; mandibles short but powerful, without seta in the scrobe, slightly curved at apex, blunt, edentate, widely separated at base, and when closed completely concealed by the labrum ; ligula short and narrow, bisetose, surrounded by the wide membranous paraglossæ, which are glabrous, dilated at apex, with a notch at the point where they meet in front ; mentum small but wide, emarginate and without tooth ; maxillæ short, hooked at apex and very sharp, fringed with few but stout spinules ; palpi small, sparsely setose, last joint acuminate, but truncated at tip, equal in labials to penultimate, a little longer in maxillaries ; antennæ pubescent from joint 3, the joints about equal, but two a little shorter than the rest. *Prothorax* very wide, bordered throughout, though very finely in front, a seta at sides just before middle, none at hind angles, which are almost completely rounded. *Elytra* short and quadrate, convex, with bordered base, 9-striate, 8 rather deeply impressed in front and behind, a scutellary striole, intervals flat. 3 with a single pore near apex, adjoining stria 2, apex truncate and slightly emarginate on each side, without any inner plica. *Sternum* : prosternal process rounded, finely setose, metepisterna elongate, strongly narrowed behind. *Venter* with the segments finely bordered, bisetose, last one with two widely distant setæ on each side. *Legs* rather short, front tibiæ moderately notched, half a dozen small spines on outer margin, apex not produced externally, middle and hind tibiæ spinulose, tarsal joints triangular, hind tarsi with joint 1 very nearly equal to $2 + 3 + 4$. In none of the specimens examined are the front tarsi dilated or squamulate beneath. One example is certainly ♀, and I think possibly all belong to this sex.

Laferté's description of the genus being very incomplete, I have re-described it, and have given to the species the name which Chaudoir had intended to give it, had he lived to complete the work on the Harpalini upon which he was engaged at the time of his death. The genus seems to be most nearly allied to *Amblystomus*, though differing in its symmetrical

head and setose palpi. The only species known at present come from West Africa, and are unknown to me; according to Laferté the typical species, *A. torridus*, Laf., has no prothoracic marginal channel, and this appears to be the chief structural difference between it and the Indian species,

ANOMOSTOMUS ORIENTALIS sp. nov.

Length: 6·0—8·0 mm. Width: 2·6—3·0 mm.

Black, shiny, elytra often with a greenish tinge, labrum, joints 1–2 of antennæ, palpi, and legs testaceous red, joints 3–11 of antennæ, border of prothorax and elytra, and under-side more or less piceous red.

Head very smooth, not contracted behind, antennæ just reaching base of prothorax. *Prothorax* a little wider than head and twice as wide as long, base arcuate, apex widely though slightly emarginate, sides evenly rounded, though contracted a little more behind than in front; median line and transverse impressions faint, basal foveæ small but distinct, punctate, marginal channels slightly crenulate, surface generally smooth. *Elytra* with very square shoulders, very little wider than prothorax, and half as long again as wide, striæ clearly cut and finely crenulate, marginal series of pores widely interrupted, surface very finely but not closely punctate, much more evidently along marginal channel and towards apex.

Ceylon: Hambantota (Colombo Museum), "Ceylon" (British Museum). Madras: Madura (R. Barton Wright—my collection (type)) and Madras town (Capt. Patton—Bomb. Nat. Hist. Socy., and Tomlin—coll. Champion). Mysore: Chikkaballapura (T. V. Campbell—coll. E. A. Butler). Orissa: Puri (F. H. Gravely—Ind. Mus.).

ACUPALPUS HORNI sp. nov.

Length: 3·5—4·0 mm. Width: 1·1—1·3 mm.

Testaceous yellow or red, shiny, disk of elytra (except suture) and head often darker, sometimes black.

Head very convex, eyes prominent, clypeal suture very deep, produced backwards to eye on each side, so that there is a distinct ridge along each side of head in front, antennæ

rather thick, reaching a little beyond base of prothorax, surface quite smooth. *Prothorax* quadrate-cordate, rather flat, a little wider than head, and about a third as wide again as long, extremities truncate, middle of base produced slightly backwards, sides reflexed, more widely behind, slightly rounded in front, with a long faint sinuation to the nearly rectangular hind angles; median line entire, deep and comparatively wide, basal foveæ short, deep, wide, and linear, the side border turning the angles and just reaching their base, the whole basal area rather depressed, surface smooth. *Elytra* elongate, parallel, depressed, about half as wide again as prothorax, and nearly twice as long as wide, apex almost truncate, striae fairly deep, very finely crenulate, intervals moderately convex, 3 with a single pore rather behind middle. Ventral surface distinctly pilose; front tarsi ♂ with joints very little dilated, scaly beneath.

Not unlike *Acupalpus sinuellus* Bates and belonging to Motschulsky's *Anthracus* group. Form more slender and coloration rather different, the antennæ in particular being uniformly testaceous. Head with less prominent eyes and deeper clypeal suture; prothorax more quadrate, base impunctate, the foveæ linear and very clearly cut; elytra narrower, the intervals narrower and rather more convex.

Ceylon: Anuradhapura. (Dr. W. Horn—Deutsch. Ent. Mus.). Burma: Mandalay (H. L. Andrewes—my collection (type)); Tenasserim (J. W. Helfer—Prague Mus.); India: Bombay, Belgaum (H. E. Andrewes "taken under stones along margin of large tank, Dec. 1886"): United Provinces: Sitapur (H. G. Champion).

The Belgaum examples are uniformly light in colour, the Ceylon examples both light and dark, the Mandalay and Sitapur examples dark.

ABACETUS HENRYI sp. nov.

Length: 5.25—7.0 mm. Width: 2.0—2.5 mm.

Black, iridescent, shiny: joints 1-3 of antennæ, palpi, apical border of elytra, and legs red, rest of antennæ brown.

Head rather small, convex, eyes moderately prominent, frontal furrows short, not usually deep, curved sharply outwards behind, and generally continued as a fine line round eyes, thus producing a slight ridge just inside front supra-orbital pore, clypeus and front both transversely depressed, front of head on each side generally with a faint oblique depression; surface quite smooth. *Prothorax* convex, much wider than head, slightly transverse, widest just before middle, about equally contracted at extremities, base truncate, its sides a little oblique, apex slightly emarginate, both bordered at sides, but along the base there is also a faint, generally crenulate line, connecting (or nearly so) the basal furrows, sides with a moderately narrow reflexed border, very evenly rounded and not sinuate before hind angles, which are obtuse but not rounded, a pore and seta a little before middle and another on the angle; median line very faint, but more visible towards base, basal furrows fairly short and straight, linear, joining the marginal channel along sides of base, surface quite smooth throughout. *Elytra* moderately convex, nearly half as wide again as prothorax, and not quite twice as long as wide, basal border bisinuate, forming with side border an obtuse angle at shoulder, sides nearly parallel, slightly sinuate near apex, which is a little pointed; striæ fairly deep and clearly cut, impunctate, though 8 and marginal channel are sometimes faintly crenulate, 2 with an umbilicate pore at base, intervals not very convex, 3 with a pore adjoining stria 2 and placed a little behind middle, marginal series on stria 8, which is deeper than the other striæ, surface smooth.

Allied to *A. dejeani* Nietn., but larger. Head similar, prothorax a little wider, not so narrowly bordered, basal furrows parallel with median line, not inclining behind towards the hind angles, the space between them quite smooth (though this is sometimes the case in *dejeani*); elytra with more rounded sides, the striæ not quite so deep.

Ceylon: Kala-oya river (type) and Colombo; Negombo, Matale, Kandy, and Anuradhapura (Dr. W. Horn—Deutsch. Ent. Mus.). Madras: Trichinopoly, 1 ex. Type in British Museum.

COLPODES FLETCHERI sp. nov.

Length : 11.0 mm. Width : 4.6 mm.

Black : palpi, antennæ, and legs testaceous red, margin of prothorax rufous.

Head very convex, with prominent eyes, frontal foveæ elongate, shallow, labrum depressed in middle, mandibles and palpi elongate, antennæ slender, filiform, reaching basal third of elytra. *Prothorax* moderately convex, cordate, transverse, half as wide again as head, and about a third as wide again as long, base truncate, its sides a little oblique, apex emarginate, front angles rounded, sides rather widely explanate and reflexed, widest before middle, strongly rounded in front, sinuate just before hind angles, which are slightly obtuse, but very little rounded ; median line fine, transverse impressions moderate, basal foveæ fairly deep, continued forwards nearly to apex as a fine groove, parallel with margin, surface smooth, with some fine cross striation, base and margins faintly rugose. *Elytra* rather flat, two-thirds as wide again as prothorax, and not quite half as long again as wide, shoulders well marked, gently dilated behind and widest at two-fifths from apex, margin rather strongly sinuate behind, with a re-entrant angle at apex, and a small blunt tooth at the end of interval 1 on each side ; striæ, including a scutellary stria, very clearly incised and finely crenulate, 5 exceptionally deep on basal half. intervals nearly flat, 3 with three pores, at one, three, and four fifths from base, surface smooth but uneven, an elongate depression on basal half covering intervals 4-6, and a much smaller and slighter one towards apex on 5-6. *Metepisterna* considerably longer than wide. *Tibiæ* with a fine external groove ; *tarsi* grooved on each side, joint 4 moderately bilobed, on metatarsi the outer lobe a little longer than the inner one, joint 5 glabrous.

About the size of the common Eastern species *C. buchanani* Hope, but black. Head more convex, mandibles and palpi longer ; prothorax wider, sides more broadly explanate, more reflexed ; elytra wider, more deeply striate, with a strongly marked elongate depression, middle and hind pores on interval 3 much further towards apex.

Ceylon : *Madulsima* (T. B. Fletcher), 2 ex. ♂♀. The type is in the British Museum : cotype in my collection.

EUPLYNES MARGINATUS sp. nov.

Length : 6·25—7·0 mm. Width : 2·75—3·0 mm.

Testaceous red, shiny : elytra with a black margin, occupying about two-fifths of each elytron, reaching stria 6 at shoulder and gradually widening behind, just reaching suture near apex, but leaving the actual apex and the whole border narrowly red.

Head flat, eyes prominent, frontal foveæ short, but clearly marked, curving towards eye, surface smooth, very minutely—almost imperceptibly—punctate. *Prothorax* transverse, rather flat, a third as wide again as head, base and apex truncate, former with oblique sides, front angles quite rounded, sides rounded, sinuate just before hind angles, which are sharp and would be rectangular, but for the oblique sides of base, a pore and seta at apical third, and another on hind angle (though the setæ here are abraded) ; median line well marked, basal foveæ obsolescent, surface (like that of head) minutely punctate, faintly rugose in the foveæ. *Elytra* rather flat, nearly twice as wide as prothorax, and half as long again as wide, sides gently rounded, hardly truncate at extremity ; striæ fine, minutely but not very noticeably crenulate, intervals 1–6 flat, 7–8 narrower and more convex, especially on shoulder, 3 with three pores, at a quarter and a half (adjoining stria 3), and at five-sixths (adjoining stria 2), 5 with a deep longitudinal depression on basal half (though not reaching base or middle), curving inwards behind and occupying at least half of each of the two adjoining intervals, marginal series slightly interrupted at middle, the pores large, surface shagreened and minutely punctate.

Very much like *E. limbipennis* Bates, but the elytral margin is black instead of blue-green. Head and prothorax similar, but basal foveæ of latter much less marked ; striæ of elytra finer and less evidently crenulate, intervals flatter, the pores on 3 smaller, the depression on 5 curving inwards behind, not straight.

Ceylon : 2 ex. The type is in my collection and is labelled Kekirawa ; the second specimen (cotype), which has no locality label, is in the Colombo Museum. In the other described species from Ceylon, *E. dohrni* Nietn., the elytra are said to be green.

ARAME STIGMA sp. nov.

Length : 6.75 mm. Width 2.0 mm.

Black : palpi and joints 1-3 of antennæ testaceous, rest of antennæ brown ; last ventral segment and legs rufous. base of femora lighter ; a white apical spot on each elytron.

Head convex, fairly wide, obliquely and gradually narrowed behind the prominent eyes to the very narrow, condyliform neck, front strongly bi-impressed, a small, shallow depression in middle, surface smooth and polished, two erect setæ on each side behind (in addition to the supra-orbital setæ), neck finely, transversely striate. *Prothorax* elongate, convex, cylindrical, dilated in middle, narrower than head, and nearly twice as long as wide, strongly contracted at extremities, but narrower in front than behind, widest a little behind middle, base constricted and transversely striate, sides without border, but each with a row of about five long erect setæ, a slight longitudinal groove on each side close to neck, median line very fine, surface smooth. *Elytra* moderately convex, twice as wide as head and half as long again as wide, shoulders oblique, but rather sharply angled, slightly dilated behind and widest at apical third. apex truncate, rather faintly striate punctate, the punctures much more visible close to base, 8 and 9 much deeper than the others, scutellary striae very faintly marked ; intervals flat, 3 and 5 each with 6-8 erect setæ : surface smooth, but very finely shagreened, a strong transverse impression at a fourth from base, the white spot at a fifth from apex, on intervals 5-6. nearly round, but produced a little both in front and behind. The under, like the upper surface is impunctate, the metopisterna very long and narrow, the femora sparsely clothed with long hairs.

Very closely allied to *A. distigma* Chaud.—(*A. bimaculata* Schm.-Goeb.) from Burma, but rather differently coloured, the prothorax black (not brown red). the elytral spot smaller

and white (not yellow). Head similar, but with larger eyes ; prothorax wider, less attenuated in front ; elytra shorter, less distinctly striate, interval 5 with numerous setæ (instead of only one), interval 7 without setæ.

Ceylon (Thwaites), 2 ex. Type in Oxford University Museum (Hope Dept.) ; cotype in my collection.

ZUPHIUM EREBEUM sp. nov.

Length (including abdomen): 9·0 mm. Width: 3·0 mm.

Piceous : apex of palpi testaceous, labrum, femora, an ill-defined shoulder spot, and apical border of elytra dark reddish-brown.

Head convex behind, flat in front, shiny, eyes flat, genæ sharply rounded and reaching neck at a right angle, a triangular punctured depression on middle of front, surface finely and a little sparsely punctate. *Prothorax* cordate, moderately convex, hardly longer than wide, a third as wide again as head, base truncate in middle, strongly bisinuate at sides, apex slightly arcuate, sides finely bordered, gently rounded in front, strongly contracted behind, sinuate at some little distance before base, hind angles right, projecting a little laterally and moderately reflexed ; median line extremely fine, rather deeper near base, the foveæ deep, somewhat elongate, contiguous to hind angles, surface finely, closely, and uniformly punctate. *Elytra* rather flat, nearly parallel, truncate at apex, shoulders moderately rounded, not quite twice as wide as prothorax, a third as long again as wide ; striæ faintly punctate, only vaguely indicated behind, rather more clearly in front, where the intervals are slightly convex, marginal series of pores widely interrupted in middle, surface extremely finely and closely punctate ; the very vaguely marked shoulder spot extends inwards from near margin to stria 3.

About the size of the common and widely distributed *Z. olens* Rossi, but quite differently coloured. The head and prothorax differ little in form, though the latter is rather wider, and its base a good deal more strongly sinuate at sides : elytra much shorter, the striæ obsolete behind, the surface a little more finely punctate.

Ceylon, 1 ex. British Museum.

GNOPHODES gen. nov.

Head small, convex, narrowed behind, eyes not very prominent, reaching buccal fissure, two supra-orbital setæ, the hind one distant from eye; a gular seta on each side, considerably behind buccal fissure; clypeus bisetose, truncate, suture faint, ending on each side in a small pore; labrum small, quadrate, sex-setose, very slightly emarginate; mandibles slender, curved and sharp at apex; ligula elongate, dilated and arcuate at apex, quadri-setose, paraglossæ coriaceous, adnate, narrower than ligula, though not much longer, completely enveloping it, densely setose at apex; mentum edentate, a long seta on each side of the sinus at base, lobes nearly straight within, strongly rounded outwardly; maxillæ elongate, curved at apex, and sharply pointed, densely fringed with very fine hairs; palpi slender, last joint compressed, rounded at apex, in maxillaries 4 is half as long again as 3, in labials $2 = 3$, 2 unisetose on inner margin; antennæ densely pubescent from joint 5, but 2-4 are sparsely pubescent, joint $1 = 5$, 2 very short, 3 about twice as long as 2, 4 rather shorter than 3, the remainder a little shorter than 4. *Prothorax* convex, apex emarginate, sides widely explanate and reflexed, two well-marked setiferous pores on the margin, one at middle, the second at hind angle. *Elytra* moderately convex, quadrate, but with sides strongly rounded behind shoulders, apex truncate, 9-striate, but stria 9 more or less obsolete, interval 9 and marginal channel forming a moderately wide, explanate, and reflexed margin, a short scutellary striole between stria 1 and suture, interval 3 with two pores, one rather behind middle, the second at apical fourth. *Sternum*: prosternal process unbordered, with one or two small setæ, metepisterna narrowed behind, not much longer than wide. *Venter* with segments bisetose, last segment bisetose in ♂, quadri-setose in ♀. *Legs* slender, tibiæ minutely setose, tarsi glabrous above, in hind pair joint $1 = 2 + 3$, front tarsi ♂ with three moderately dilated joints, clothed with scales beneath, claws long, each with some half dozen short teeth on basal two-thirds.

The new genus belongs to the *Coptoderini*, and in some respects is not unlike *Thyreopterus* and *Peripristus*, but joints 2-4 of the antennæ are sparsely pilose, the claws pectinate,

the paraglossæ pilose, and the shape of the prothorax quite different. There is no sign of denticulation on the elytral border, as in *Peripristus* and *Sinurus*.

GNOPHODES PEARSONI sp. nov.

Length : 9·5—10·5 mm. Width : 3·5—4·25 mm.

Black, shiny, the elytra sericeous : buccal organs, antennæ, legs, margins and epipleuræ of prothorax and elytra a rather dull red.

Head (1·5 mm. wide) with narrow neck, and very oblique genæ, frontal furrows obsolete, but the front is uneven at sides, antennæ barely reaching basal fourth of elytra. *Prothorax* as long as wide (2·6 mm.), sides of base cut away very obliquely and strongly reflexed, contracted rather more in front than behind, sides evenly rounded, not sinuate before base, front angles porrect, hind angles obtuse and inconspicuous ; median line well marked, reaching extremities, front transverse impression visible at middle, hind one fairly deep, foveæ small but continued forwards as a faint depression, parallel with margin, surface impunctate with a few fine transverse striæ. *Elytra* (4·25 × 5·5 mm.) with well-marked basal border, bisinuate, narrower than prothorax at middle, and rounded at shoulder, sides rounded, greatest width rather before middle, apical truncature only slightly oblique, moderately emarginate on each side, outer angles rounded, a small re-entrant angle at apex, the base much narrower than the truncate apex, striæ finely crenulate, intervals nearly flat, marginal series of pores interrupted, surface smooth, very finely shagreened.

I do not know of any species with which I can profitably compare this. The prothorax is rather like that of a *Dolichoctis*, with much rounded hind angles ; the elytra, compared with those of *Peripristus ater*, are more convex, much narrower at base and more sharply dilated behind shoulder, the apical truncature wider, stria 9 obsolete, border not serrate.

Ceylon : Hakgala, 1 ex. ♂ (Colombo Mus.), Horton Plains (Dr. W. Horn—Deutsch. Ent. Mus.), 2 ex. ♂♂. 1 ex. ♀. "Ceylon" (Thwaites—Oxford Museum), 1 ex. ♀. The type is in my collection.

In one of the examples from Horton Plains, which is light brown in colour and evidently much undeveloped, there is a yellowish spot on each elytron near apex on interval 2-5; in a second example it is visible, though much fainter.

DOLICHOCTIS CHITRA sp. nov.

Length: 5.0—6.0 mm. Width: 2.0—2.5 mm.

Testaceous: head brown, elytra piceous black, but with two spots on each and marginal channel testaceous.

Head moderately convex, dull, shagreened without impressions, eyes rather large and prominent, antennæ reaching beyond base of prothorax. *Prothorax* moderately convex, transverse, half as wide again as head, base arcuate, apex emarginate, a little more contracted in front than behind, sides rounded in front, straight behind, moderately explanate and reflexed, a pore and seta rather before middle, forming almost an angle at widest point, another on the obtuse hind angles; median line, basal foveæ, and transverse impression between the foveæ all fairly well marked, surface moderately shiny, faintly shagreened, and with some fine, hardly perceptible cross-striation. *Elytra* convex, short oval, rather more than half as wide again as prothorax, a third as long again as wide, shoulders well marked, sides rounded, apex truncate, slightly emarginate on each side, minutely and sharply dentate opposite sutural interval; striæ clearly marked, faintly crenulate, intervals flat on disk, a little more convex at sides and behind, 3 with three pores, one near base, the other two at about three-fifths and four-fifths from base respectively, surface smooth and shiny; the front spot is rather elongate, covering the shoulder and reaching margin in front, extending inwards to stria 4. hind spot rounded, covering intervals 2-5.

A little larger than *D. fasciola* Bates, and much lighter in colour, the prothorax testaceous. In Bates' species the front spot is transverse, reaching inwardly to stria 3, and not extending to shoulder, the hind spot much larger. In the new species the width of the prothorax is a little variable, but it is less than in *fasciola*, the striæ are deeper, and the outer intervals certainly more convex, the sutural interval more sharply dentate at apex.

Ceylon (H. P. Green—my collection (type) Nalanda, Negombo, and Kandy (Dr. W. Horn—Deutsch. Ent. Mus.). Ceylon (Nictner, Stettin Mus.).

CYMINDOIDEA MUNDA sp. nov.

Length : 6·0—7·0 mm. Width : 2·0—2·3 mm.

Piceous black, rather dull : joint 1 of antennæ, a shoulder spot on elytra, epipleuræ of elytra, and legs testaceous yellow ; rest of antennæ, palpi, front of clypeus, labrum, margin of prothorax, and marginal channel of elytra reddish, mandibles darker.

Head wide, flat, with close longitudinal striation extending forwards to middle of clypeus, eyes large, flat, clypeus slightly, labrum distinctly emarginate, antennæ rather thick, just reaching base of prothorax. *Prothorax* cordate, moderately convex, a little wider than head, very little wider than long, base strongly arcuate, the middle of the arc produced a little way backwards over the peduncle, apex moderately emarginate, front angles rounded, hind angles indicated by a minute tooth, sides bordered, gently rounded, and slightly reflexed, a pore and seta just behind front angles, another on hind angles ; median line very sharply incised, transverse impressions and basal foveæ only faintly indicated, surface finely, closely, and confluent punctate, longitudinally striate along middle of apical margin. *Elytra* elongate-ovate, flat, about half as wide again as prothorax, and more than half as long again as wide, base narrowly bordered, emarginate, shoulders porrect, gradually widened behind, widest at a third from apex, which is obliquely truncate ; finely punctate-striate, with a fairly long scutellary stria, intervals slightly convex, 3 with two pores, near stria 3, one rather before and one behind middle, surface shagreened, rather dull ; the shoulder spot extends inwards to stria 4 (type), and to stria 5 (Ceylon ex.) with a slight indentation behind on interval 8.

Closely allied to *C. nigra* Chaud., but with testaceous legs and shoulder spot. Head and prothorax very similar, but the base of the latter is more produced and less coarsely punctate, the intervals of the elytra impunctate, and the two pores on 3

much less conspicuous. The South African *C. humeralis* Pér., is almost exactly similar in pattern, but differs in some structural characters.

India : Nilgiri Hills (H. L. Andrewes—my collection (type)), 1 ex. ; Ceylon : Bandarawela (Dr. W. Horn—Deutsch. Ent. Mus.), 2 ex. ; cotypes.

MICROLESTES DEMESSUS sp. nov.

Length : 3·5 mm. Width 1·2 mm.

Black, with faint aeneous tinge beneath, above aeneous, finely shagreened, glossy ; legs more or less piceous, tips of palpi, coxæ, and trochanters testaceous.

Head rather flat, smooth, but with very fine scattered punctures, impressions obsolete, sides of front finely bordered, eyes large and prominent. *Prothorax* transverse, moderately convex, hardly wider than head, base bordered and moderately produced in middle, its sides oblique, apex emarginate, very finely bordered, sides bordered, gently rounded in front, hardly sinuate before the obtuse hind angles, a seta at apical third and another on the hind angles ; median line short but deep, hind transverse impression fairly marked, the foveæ shallow and ill-defined, surface smooth (like that of the head), but with fine scattered punctures, base a little more coarsely punctate. *Elytra* rather flat and nearly parallel, though contracted near base and with rounded shoulders, twice as wide as prothorax, and rather more than half as long again as wide, rectangularly truncate at extremity, leaving the abdomen largely exposed, outer angle widely rounded ; punctate-striate, the striæ faint, especially at sides, the punctures extremely minute, 1 and 2 arising in a large umbilicate pore, interval 3 with two pores, one adjoining stria 3 and placed rather before middle, the second adjoining stria 2 at apical fourth ; surface with minute scattered punctures, apical sixth much more shiny than the rest.

Distinctly duller than *M. inconspicuus* Schm.-Goeb., the prothorax with deeper median line, the elytra much more elongate, the sides less rounded, the striæ more evident, the glossy surface more opaque.

Ceylon : Kanthalay, Trincomalee, and Anuradhapura (Dr. W. Horn—Deutsch. Ent. Mus.). The type is in my collection ; cotypes in Deutsch. Ent. Mus.

LEBIA DICHROMA sp. nov.

Length : 4·5—6·0 mm. Width : 1·8—2·6 mm.

Testaceous with a reddish tinge on upper surface, moderately shiny ; elytra blue, with a metallic green lustre at sides, the border and a sutural stripe reddish. The stripe at base covers three intervals on each side, from middle gradually contracting to sutural interval, generally expanding a little at apex, but sometimes disappearing altogether.

Head (1·25 mm. wide) convex behind, flat in front, eyes prominent, a small round depression at each end of clypeal suture, a shallow V-shaped depression on front, palpi short and slender, mentum with a wide tooth, not much rounded, surface moderately punctate, the punctures of different sizes, a little striate near eyes. *Prothorax* transverse (1·0 × 1·4 mm.), moderately convex, base produced in middle, the re-entrant angles obtuse, apex truncate, front angles rounded, sides very faintly bordered, distinctly explanate, more widely so behind, rounded in front, then straight to hind angles, which are nearly right and project a little laterally, a pore and seta on the angle, another within the border rather before middle ; median line faint, hind transverse impression forming a deep furrow, surface finely and confluent punctate. *Elytra* (2·6 × 3·5 mm.) moderately convex, widened behind, and widest at about two-thirds, base bisinuate, shoulders fairly marked, punctate striate, the punctures very fine, intervals slightly convex, 3 with two pores adjoining stria 3, marginal series on 9 with very large pores, uninterrupted, surface very distinctly shagreened. Claws with 4–5 teeth on each.

I know of no other Eastern *Lebia* presenting at all the coloration of this species, though in form and structure it closely resembles such species, as *L. circumdata* Schm.-Goeb., and *L. gressoria* Chaud. From these, however, it is at once distinguished by the puncturation of the head and prothorax.

Ceylon : Hambegamuwa (Colombo Museum), Anuradhapura Dr. W. Horn—Deutsch. Ent. Mus.). Madras : Nilgiri Hills (Sir G. F. Hampson—Brit. Mus.). Haidarabad : Sikandarabad (Capt. F. Butler—coll. E. A. Butler). Bombay : Khandesh (T. R. D. Bell—my collection (type)) and Bombay town (N. B. Kinnear—Bomb. Nat Hist. Soc.). Bengal : Chapra (Mackenzie—Agric. Res. Inst., Pusa).

In the example from Anuradhapura the colour is very light the elytra with a violaceous tinge ; the Sikandarabad example, on the other hand, is distinctly greenish.

LEBIA MONOSTIGMA sp. nov.

Length : 5.0—6.0 mm. Width : 2.2—2.6 mm.

Testaceous yellow, head, prothorax, and joints 4–11 of antennæ with a faint reddish tinge, a common, round, black spot on the elytra, just behind middle, extending on each side to stria 4.

Head rather wide, flat, with very large and prominent eyes, frontal depressions small, round, and shallow, antennæ reaching basal fourth of elytra, slightly incrassate towards apex, surface smooth. *Prothorax* moderately convex, not much wider than head, almost twice as wide as long, base truncate, with a short median lobe, sides a little oblique, apex slightly emarginate, front angles strongly rounded, sides much rounded in front, but little contracted behind, without sinuation, an explanate margin, much broader at hind angles, which are only slightly more than right, moderately reflexed ; median line slight, basal transverse impression deep, surface very finely shagreened, with some minute transverse striation. *Elytra* convex, twice as wide as prothorax, less than half as long again as wide, dilated behind and widest at apical third, sides gently rounded, apex obliquely truncate, striæ deep, faintly crenulate, though with the appearance of having closely set, large, shallow punctures, intervals convex, 3 with a single pore at apical fourth, adjoining stria 3, surface smooth and shiny. Claws pectinate, with about four long teeth on each.

Very closely allied to *L. calycophora* Schm.-Goeb., but all the black markings on the elytra in that species have disappeared, excepting the central spot; the prothorax appears rather narrower, the hind angles a little more rounded, the outer angle of the apical truncature of the elytra less rounded. It is quite possible that this may prove to be a race of Schmidt-Goebel's species.

Ceylon (Thwaites—Oxford Museum). Madras: Kodaikanal (Dr. T. V. Campbell—coll. E. A. Butler). West Sarawak: Quop (G. E. Bryant—my collection (type)).

June 8, 1922.

H. E. ANDREWES.

**NOTES ON SNAKES COLLECTED ON ANNASIGALLA
ESTATE FROM AUGUST, 1920, TO
DECEMBER, 1921.**

By F. WALL, C.M.G., C.M.Z.S., F.L.S., Colonel I.M.S.

I AM indebted to Mr. W. W. A. Phillips for a very valuable collection of snakes made by him on Annasigalla Estate, Matugama, Kalutara District. In "*Spolia Zeylanica*" (Vol. XI., parts 43 and 44), I referred to specimens he had sent me up to August, 1920. Since that date Mr. Phillips has repeatedly sent me the results of his collecting, and the present paper deals with the material acquired between August, 1920, and December 31, 1921. The collection is an unusually valuable one, as Mr. Phillips has attached labels to his specimens, giving dates and any field notes of interest. In a few instances labels became detached in transit, and his observations unfortunately were wasted. Annasigalla is about 50 feet above sea level, and is situated in the south of the Western Province, some five miles from the sea, on the margin of the wettest zone in the Island, where the annual rainfall averages from 150 to 200 inches. The rainfall on his estate in 1921 was as follows :—

			Inches.
January	..	..	7·13
February	..	..	·49
March	..	..	2·42
April	..	..	22·63
May	..	..	15·22
June	..	..	7·19
July	..	..	8·06
August	..	..	14·32
September	..	..	5·35
October	..	..	13·37
November	..	..	8·46
December	..	..	3·71
Total ..			<u>108·35</u>

“AN APPEAL.”

The Author would be glad to finance any Planter in the Hill Districts who would undertake to collect snakes on the lines adopted by Mr. Phillips.

Family **TYPHLOPIDÆ.****TYPHLOPS BRAMINUS** (Daudin.)

Serial No.	Date.	Length in mm.	Remarks.
1920.			
1 ..	November 17 ..	138 ..	Appeared gravid, but distension entirely due to fat.
2 ..	November 18 ..	132 ..	—
1921.			
3 ..	January 31 ..	152 ..	—
4 ..	May 28 ..	115 ..	Turned up from loose soil.
5 ..	June 5 ..	138 ..	—
6 ..	June 16 ..	115 ..	—
7 ..	July 15 ..	87 ..	—
8 ..	September 9 ..	132 ..	—
9 ..	November 23 ..	138 ..	Found under a rotten log.

No. 6 calls for special remark. At first it appeared to me a species quite distinct from *braminus*, and it exactly accords with another specimen in the Colombo Museum labelled *braminus*, 152 mm. long, the locality of which is not on record. The colour dorsally is a uniform light brown, the belly is dirty whitish, the mouth, anal region and tail tip, white. In this respect it differs from typical *braminus*, in which the dorsal colour is a darker brown, and the scales when viewed closely are conspicuously darker in their basal two-fifths. In both specimens the suture below the nostril passes to the 2nd labial instead of to the præocular, and this is the only difference in lepidosis I can find between this and typical *braminus*. I have on two occasions, however, found typical *braminus* with this suture normal on one side, and passing to the 2nd labial on the other, and in one specimen I found the anomaly on both sides. This has led me to alter my views, and suppress the species described by me in 1919 as *fletcheri* in the Bombay Natural History Journal (Vol. XXVI., p. 556). The tail ends in a spine in both these specimens as it does in *braminus*.

TYPHLOPS LEUCOMELAS Boulenger.

A single adult specimen 138 mm. long ($5\frac{1}{2}$ inches) was captured on June 18, 1921. This is only the third specimen known. It differs from Boulenger's figure (*vide* Snakes of

Ceylon, Wall, page 14) in that there is a large shield behind the interparietal. As in *braminus* the scales are darker basally than elsewhere. The species is evidently a low-country one.

Family ILYSIIDÆ.

Genus CYLINDROPHIS.

CYLINDROPHIS MACULATUS (Linné.)

Serial No.	Date.	Length in mm.	Two Head-lengths behind Head.	Midbody.	Two Head-lengths before Vent.	Ventrals.	Subcaudals.	Remarks.
	1921.							
11	July 19	367	19	21	19	195	5	All subcaudals entire.
12	July 27	330	17·19	21	17	199	4	Last subcaudal divided, the rest entire
13	Sept. 3	218	18	19	19	192	5	Under a large stone
14	Oct. 20	299	17	19	19	196	5	Last three subcaudals entire. Penultimate ventral trifid. Among rocks and leaves.
15	Nov. 5	318	18	19	19	197	5	All subcaudals entire. Penultimate ventral trifid. Found under refuse.

Family UROPELTIDÆ.

It is interesting to note the complete absence of any species of this family in the locality of Annasigalla.

Family **COLUBRIDÆ.**Genus **POLYODONTOPHIS.****POLYODONTOPHIS SUBPUNCTATUS (Dumeril & Bibron.)**

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
16	1920. Dec. ?	♂	278	159	60	Supralabials 9 ; 3rd, 4th, and 5th touching eye.
17	1921. Jan. 28	♀	389	173	57	Gravid. Contained one egg, 28 mm. long, with no trace of embryo
18	Mar. 22	♀	340	170	35?	Gravid. Contained four eggs about 12 mm. long. Tail 43 mm., imperfect
19	June 18	♂ ?	221	159	64	—
20	Sept. 1	♀ ?	221	168	54	The tail of a lizard (skink ?) in the stomach
21	Dec. 15	♀ ?	342	168	53	First subcaudal entire. Found in leaves in rubber field.

Genus **NERODIA.****NERODIA PISCATOR (Schneider.)**

Serial No.	Date.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
22	1920. Dec. 17	704	140	83	Var. <i>quincunciatus</i>
23	Dec. 17	470	139	79	Var. <i>asperrimus</i>
24	1921. Sept. 28	548	—	—	Var. <i>asperrimus</i>
25	Oct. 14	874	—	—	Var. <i>asperrimus</i> . In drain in rubber field

Mr. Phillips informs me it is very common in the paddy fields.

Genus RHABDOPHIS.

RHABDOPHIS STOLATUS (Linné.)

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
	1920.					
26	Nov. 7	♀	524	—	—	Gravid. Contained five nearly mature eggs.
	1921.					
27	June 18	—	212	—	—	Found in a paddy field.
28	June 29	♀	530	143	?	Tail deficient. Four follicles impregnated.
29	July 4	♀	470	144	71	Four follicles impregnated.
30	July 7	♀	568	145	79	Gravid. Contained three eggs.
31	July 9	♂	—	—	—	—
32	July 9	♂	470	144	?	Tail deficient. Four postoculars on left side.
33	Oct. 3	—	262	—	—	—
34	Nov. 3	♂	509	141	77	Four postoculars on both sides.
35	Dec. 5	—	500	—	—	—
36	Dec. 25	♂	470	143	78	Seven supralabials, the 3rd and 4th touching the eye. Four postoculars on both sides.

In India September is the latest record for the deposition of eggs. Specimen No. 26 is therefore interesting; the eggs would probably have been deposited in November.

Genus OPHITES.

OPHITES AULICUS (Linné.)

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
37	1920. Nov. 5	♀	762	202	61	Killed in cooly lines. Gravid. Contained ten eggs 19 mm. long.
38	Nov. 19	♂ ?	490	186	65	Var. <i>oligozonatus</i> . Killed in bungalow.
39	?	♀ ?	237	196	61	Var. <i>aulicus</i> . A skink in stomach.
40	1921. Oct. 6	—	505	—	—	Var. <i>oligozonatus</i> . Bit a cooly, with no ill effects.
41	Nov. 5	♂	647	182	66	Var. <i>oligozonatus</i> . Killed in bath-room of bungalow.
42	Dec. 12	—	205	—	—	Var. <i>oligozonatus</i>

The gravid specimen killed in November extends the previously known breeding season.

Genus COLUBER.

COLUBER HELENA Daudin.

Serial No.	Date	Length in mm.	Two Head-lengths behind Head	Midbody.	Two Head-lengths before Vent.	Ventrals.	Subcaudals.	Remarks.
43	1921. Mar. 1	592	25	27	21	228	94	A small mouse in stomach
44	May 19	598	—	—	—	—	—	—
45	Oct. 16	1080	25	27	21	235	84	—
46	Nov. 3	1105	—	—	—	—	—	Killed in bungalow

Genus ASPIDURA.

ASPIDURA GUENTHERI Ferguson.

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
1920.						
47	Oct. 1	♂	152	110	22	---
48	Oct. 3	♂	138	108	26	---
49	Oct. 11	♀	75	—	—	---
50	Do.	♂	138	108	28	---
51	Oct. 16	♂	132	109	22	---
52	Dec. 11	♀	152	112	23	Gravid. Contained one egg 16 by 3.2 mm.
1921.						
53	Jan. 28	♂	143	106	27	---
54	Jan. 31	♂	143	112	23	Gravid. Contained one egg.
55	Feb. 8	♂	112	107	26	---
56	Do.	♂	104	108	26	---
57	Do.	♂ ?	140	111	26	---
58	Do.	♂	82	116	?	---
59	Do.	♂	82	112	23	---
60	Do.	♂	100	109	23	---
61	Feb. 9	♂	143	109	21	---
62	Do.	♂	125	109	27	---
63	Do.	♂	132	109	20	---
64	Do.	♂	158	114	23	---
65	Do.	♂	106	105	27	---
66	Do.	♀	132	111	22	Gravid. Contained one egg 12 mm. long. Last subcaudal divided.
67	Do.	♂	132	106	28	---
68	Do.	♂	140	113	21	---
69	Do.	♂	90	110	28	---
70	Do.	♂	90	109	28	---
71	Do.	♂	65	104	26	---
72	Do.	♂	138	111	20	---
73	Do.	♂	128	107	26	Remains of worm in stomach.
74	Do.	♂	100	118	21	---
75	Do.	♂	125	109	26	---
76	Do.	♂	93	109	28	---
77	Do.	♂	132	109	27	---
78	Do.	?	60	—	—	---

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
	1921.					
79	Feb. 9	♀	100	113	20	—
80	Do.	♂	100	104	27	—
81	Do.	♂	118	106	27	—
82	Feb. 5	♀	152	112	24	Gravid. Contained one egg.
83	Do.	♀	—	113	20	Gravid. Contained one egg. Last subcaudal divided.
84	Do.	♀	122	111	—	Gravid. Contained one egg.
85	Do.	♂	132	106	30	—
86	Do.	♀	138	115	21	Gravid. Contained one egg.
87	May 24	—	93	—	—	Dug out of silt.
88	May 27	—	82	—	—	Dug up from loose soil.
89	Do.	♀	148	110	25	Gravid. Contained one egg 12 by 4 mm.
90	Do.	♀	138	110	24	Gravid. Contained one egg 20 by 4 mm.
91	Do.	♀	128	112	23	Nos. 88 to 92 all found together among leaves in the bottom of a hole.
92	Do.	♀	132	110	23	—
93	Do.	♂	138	105	27	—
94	Do.	—	68	—	—	—
95	June 1	—	152	—	—	—
96	Do.	—	152	—	—	—
97	June 7	—	100	—	—	—
98	June 8	♀	164	—	—	Nos. 98 to 104 all found in dead leaves and silt when clearing out drains. Three were gravid females, each containing one egg.
99	Do.	♀	152	—	—	—
100	Do.	♀	152	—	—	—
101	Do.	♀	152	—	—	—
102	Do.	♀	152	—	—	—
103	Do.	—	143	—	—	—
104	Do.	—	138	—	—	—
105	Do.	♀	158	—	—	Gravid. Contained one egg 16 mm. long. Nos. 105 to 111 found beneath leaves, &c., when clearing drains.
106	Do.	—	138	—	—	—

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
	1921.					
107	June 8	—	138	—	—	—
108	Do.	—	138	—	—	—
109	Do.	—	143	—	—	—
110	Do.	—	132	—	—	—
111	Do.	—	132	—	—	—
112	June 10	+	158	—	—	Gravid. Contained one egg.
113	Do.	+	152	—	—	Gravid. Contained one egg.
114	Do.	—	143	—	—	Nos. 106 to 112 found when clearing drains.
115	Do.	—	143	—	—	—
116	Do.	—	143	—	—	—
117	Do.	—	138	—	—	—
118	Do.	—	138	—	—	—
119	June 16	—	152	—	—	An earthworm in stomach.
120	Do.	—	125	—	—	—
121	Do.	—	75	—	—	—
122	July 13	—	152	108	24	—
123	Aug. 1	♀	138	110	21	Gravid. Contained one egg.
124	Aug. 18	+	152	111	22	Gravid. Contained two eggs.
125	Aug. 29	+	164	109	?	Gravid. Contained one egg 18 by 4.6 mm.
126	Do.	♀	158	109	22	Gravid. Contained one egg 18 by 4.6 mm.
127	Do.	♀	152	112	22	Gravid. Contained one egg 18 by 4.6 mm.
128	Do.	♀	152	105	22	Gravid. Contained one egg 18 by 4.6 mm.
129	Do.	♀	112	106	21	Gravid. Contained one egg 15.5 by 4.6 mm.
130	Do.	♀	152	111	22	Gravid. Contained one egg 15.5 by 4.6 mm.
131	Do.	♂	—	101	30	Nos. 125 to 134 found with over a dozen eggs (not of this species) in various heaps of sand.
132	Do.	♂	—	104	26	—
133	Do.	♂	—	106	27	—
134	Do.	♂	—	107	25	—
135	Aug. 31	♂	138	107	30	Found under a stone.

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
	1921.					
136	Aug. 31	♀	152	112	21	Gravid. Contained one egg 15.5 mm. long.
137	Do.	♀	—	115	23	Nos. 136 to 139 found close together under sand and leaves.
138	Do.	♂	—	105	25	—
139	Do.	♀	—	104	23	—
140	Sept. 1	♀	125	116	22	Gravid. Contained one egg 18 by 4.6 mm.
141	Do.	♂	125	108	25	Nos. 140 to 143 found under earth and leaves.
142	Do.	♂	118	105	25	—
143	Do.	♂	118	109	27	—
144	Sept. 3	♀	—	110	22	Under large stone. Gravid. Contained one egg 15.5 by 3.5 mm.
145	Sept. 9	♀	143	114	22	Gravid. Contained one egg 18 mm. long.
146	Do.	♀	143	114	24	Gravid. Contained one egg 15.5 mm. long.
147	Do.	♂	125	106	28	Nos. 145 to 149 found close together under dead leaves.
148	Do.	♂ ?	82	113	26	—
149	Do.	♀	82	112	22	—
150	Do.	♀	143	114	22	Gravid. Contained one egg 18 mm. long.
151	Do.	♀	143	114	24	Gravid. Contained one egg 15 mm. long.
152	Do.	♂	125	106	28	Nos. 150 to 153 found close together under dead leaves.
153	Do.	♂ ?	82	113	26	—
154	Do.	♀	82	112	22	—
155	Do.	♀	138	110	20	Gravid. Contained one egg 18 by 4.6 mm.
156	Do.	♂	152	105	30	Nos. 155 to 158 all found close together under leaves.
157	Do.	♂	132	108	25	—
158	Do.	♂	68	102	27	—
159	Do.	♀	143	112	23	Gravid. Contained one egg 18 by 4.6 mm.
160	Do.	♂	118	106	25	—

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
161	Sept. 9	♀	143	111	?	Gravid. Contained one egg 6 mm. long.
162	Do.	♂	143	108	27	Nos. 159 to 162 found under rocks.
163	Sept. 11	♀	143	111	22	Gravid. Contained one egg 18 mm. long.
164	Do.	♀	143	113	24	Gravid. Contained one egg 18 mm. long.
165	Do.	♂	132	105	25	Nos. 163 to 165 found under rocks.
166	Do.	♀	158	110	20	—
167	Do.	♂	132	105	25	—
168	Do.	♀?	68	?	24	—
169	Do.	♀	143	111	22	Gravid. Contained one egg 18 mm. long.
170	Do.	♀	143	113	24	Gravid. Contained one egg 18 mm. long.
171	Do.	♂	106	105	25	Nos. 166 to 171 found under rocks.
172	Sept. 12	♂	118	107	27	—
173	Do.	♂	112	105	28	—
174	Do.	♂	106	106	31	—
175	Do.	♂	93	108	26	Nos. 172 to 180 all found under rocks.
176	Do.	♂	87	106	26	—
177	Do.	♂	81	107	28	—
178	Do.	♂	81	108	28	—
179	Do.	♀	118	113	23	—
180	Do.	♀	143	114	23	—
181	Do.	♂	82	108	28	—
182	Do.	♂	118	107	27	Nos. 182 to 187 found under rocks.
183	Do.	♂	112	105	28	—
184	Do.	♂	106	106	31	—
185	Do.	♂	93	108	26	—
186	Do.	♂	87	106	26	—
187	Do.	♂	82	107	28	—
188	Oct. 7	♂	138	110	27	Nos. 181 to 184 found under rocks and stones.
189	Do.	♂	138	104	?	—
190	Do.	♂	75	104	25	—
191	Do.	♀	75	115	25	—
192	Oct. 22	♂	152	110	30	Nos. 185 and 186 under stones and boulders.

Serial No.	Date.	Sex.	Length.	Ventrals.	Subcaudals.	Remarks.
1921.						
193	Oct. 22	♂	112	109	27	—
194	Nov. 2	♀	125	112	22	—
195	Nov. 2	♂	122	106	27	—
196	Do.	♂?	122	103	?	—
97	Do.	♀	132	111	24	Gravid. Contained one egg 22 by 3.2 mm.
198	Do.	♀	135	110	20	Gravid. Contained one egg.
199	Do.	♀	143	112	18	Gravid. Contained one egg.
200	Do.	♂	68	108	30	Nos. 194 to 200 found under rotting leaves.
201	Nov. 5	♀	152	110	21	—
202	Do.	♀	143	108	25	—
203	Do.	♀	143	112	23	—
204	Do.	♂	132	105	33	—
205	Nov. 15	♀	152	—	—	Gravid. Contained one egg.
206	Nov. 19	♀	143	111	22	Gravid. Contained one egg.
207	Do.	♂	132	108	26	—
208	Do.	♂	118	104	27	—
209	Do.	♀	164	—	—	Gravid. Contained one egg.
210	Nov. 30	♂	164	105	26	—
211	Do.	♀	138	108	20	—
212	Do.	♂	128	108	27	Last four subcaudals divided.
213	Do.	♂	110	102	27	—
214	Dec. 12	♀	138	—	—	Gravid. Contained one egg.
215	Do.	♀	138	—	—	Gravid. Contained one egg.
216	Do.	♀	138	—	—	Gravid. Contained one egg.
217	Do.	♀	152	—	—	Gravid. Contained one egg.
218	Do.	♀	138	—	—	Gravid. Contained one egg.
219	Do.	♀	152	—	—	Gravid. Contained one egg.
220	Do.	♂	125	—	—	Nos. 214 to 223 found among loose soil and leaves.
221	Do.	♂	112	—	—	—
222	Do.	♂	100	—	—	—
223	Do.	♂	100	—	—	—
224	Dec. 17	♀	152	—	—	Gravid. Contained one egg 18 by 3.2 mm.
225	Do.	♀	143	—	—	Gravid. Contained one egg.
226	Do.	♂	125	—	—	—
227	Do.	♂	118	—	—	—

Serial No.	Date.	Sex.	Length.	Ventrals.	Subcaudals.	Remarks.
228	Dec. 18	♀	125	—	—	Nos. 228 to 230 found in drains.
229	Do.	♀	118	—	—	—
230	Do.	♀	143	—	—	Gravid. Contained one egg 18 by 3·2 mm.
231	Dec. 20	♀	132	—	—	Gravid. Contained one egg.
232	Do.	♀	125	—	—	Gravid. Contained one egg.
233	Do.	♀	138	—	—	Gravid. Contained one egg.
234	Do.	♀	118	—	—	—
235	Do.	♀	118	—	—	—
236	Dec. 24	♀	138	—	—	Gravid. Contained one egg 18 by 3·2 mm.
237	Do.	♀	138	—	—	Gravid. Contained one egg.
238	Do.	♂	118	—	—	—
239	Dec. 25	—	—	—	—	Twenty adults, including nine ♀, each containing one egg.
to	to					
258	Dec. 31					

This series of 211 specimens sheds considerable light on the habits of the species.

Habits.—It secretes itself beneath boulders, stones, or leaves, but if such shelter is not available burrows into loose soil, or into the silt in drains.

Food.—Like other *Aspiduræ* it subsists on earthworms.

Breeding.—(a) *The Sexes* : Of 162 sexed, 73 proved to be ♂ and 89 ♀, so that the sexes are nearly balanced. Females usually attain the greater length. The male genitalia are not bifid, but are cylindrical organs beset with recurved spines in their distal three-fourths.

(b) *Method of Reproduction* : It is oviparous.

(c) *Season* : It is breeding during the whole year.

(d) *The Eggs* : These are very elongate, and before deposition measure about 18 by 4·6 mm. A single egg is the rule, but occasionally two are produced.

Growth.—(a) *The Hatchling* : Specimens which appear to have been recently hatched vary from 60 to 75 mm. in length (2 $\frac{2}{5}$ to 3 inches).

(b) *Early Life* : The annual growth cannot be estimated, as breeding occurs throughout the year.

(c) *Maturity* : The smallest egg-bound female was 112 mm. (4 $\frac{1}{2}$ inches). If as is probable this species grows at the same rate as most other snakes, and doubles its length in the first year of life, the female is mature when one year old.

(d) *Maximum Length* : The largest measurement is 164 mm. (6 $\frac{1}{2}$ inches).

Lepidosis.—(a) *Typical* : The ventrals vary from 101 to 118 (♂ 101 to 110, ♀ 105 to 118). The subcaudals range from 18 to 33 (♂ 25 to 33, ♀ 18 to 25).

(b) *Anomalies* : Rarely some of the last subcaudals are divided.

Genus DENDRELAPHIS.

DENDRELAPHIS TRISTIS (Daudin.)

Serial No.	Date	Sex.	Length in mm.	Two Head-lengths behind Head.	Midbody	Two Head-lengths before Vent.	Ventrals	Subcaudals.	Remarks
1921.									
259	Mar. 5	♀	1152	15	15	11	166	122	—
260	Mar. 6	♂	940	15	15	9	163	121	—
261	June 20	♀?	915	15	15	9	168	128	—
262	Sept. 30	♀?	1134	—	—	—	170	125	Killed in cattleshed.
263	Oct. 3	—	448	—	—	—	164	119	Found in plumbago pit.
264	Nov. 23	♀?	342	15	15	11	167	122	Apparently a hatchling.
265	Dec. 7	♀	897	15	15	11	171	125	Killed in a bush.
266	Dec. 8	♂	940	15	15	9	163	118	A skink in the stomach. Found on the ground among rubber trees.

Genus OLIGODON.

OLIGODON ARNENSIS (Shaw.)

One specimen 200 mm. long (8 inches) was killed on May 25, 1921. The loreal is absent on both sides. Ventrals 174. Subcaudals 41.

OLIGODON TÆNIOLATUS (Jerdon.)

One juvenile specimen 118 mm. long ($4\frac{3}{4}$ inches) was sent me, but the label had become detached, and the date of capture is, therefore, unknown.

I have very good reason to believe that the date of capture of this specimen was September 3, 1921.

OLIGODON SUBLINEATUS Dumeril & Bibron.

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks
269	1920. Oct. 4	♀	232	153	30	Gravid. Contained one egg 26 by 5 mm. Loreal confluent with nasal on right side.
270	Oct. 10	♂	232	139	32	—
271	1921. Jan. 24	♂	200	139	38	—
272	Feb. 27	♂	188	134	39	A small egg of a lizard (or snake ?) in the stomach.
273	Mar. 3	♂ ?	225	139	36	—
274	June 9	♀ ?	212	147	28	—
275	July 2	♂	218	139	37	—
276	July 7	♂	206	140	37	—
277	Sept. 30	♂	238	140	36	Found under a stone.
278	Oct. 18	♀	250	154	26	—
279	Oct. 26	♀	238	152	29	Found under small rock.
280	Dec. 6	♀	232	153	31	In loose leaves in a drain.
281	Dec. 23	♂	240	137	37	Found under a stone.
282	Dec. 25 to 31	♀	200	152	30	—

Genus DIPSADOMORPHUS.

DIPSADOMORPHUS CEYLONENSIS Günther.

Serial No.	Date.	Sex.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
283	1921. April ?*	♀	835	231	104	Gravid. Contained six eggs 27 by 11 mm., with minute embryos inside.
284	June 2	♂	586	230	111	Found on the ground. A <i>Calotes</i> lizard in the stomach.
285	Dec. 10	♀ ?	960	231	101	The costals are in 19 rows in all three specimens.

* The label was detached, but Mr. Phillips tells me this was taken in April, probably the first week

Genus DRYOPHIS.

DRYOPHIS MYCTERIZANS (Linné.)

Serial No.	Date.	Sex	Length.	Costals			Ventrals	Subcaudals.	Remarks
				Two Head-lengths behind Head.	Midbody	Two Head-lengths before Vent.			
286	1921. June 9	♀	1458	15	15	11	177	143	Gravid. Contained nine eggs, with small embryos about 610 mm. long.
287	July 26	♂	842	—	—	—	184	175	—
288	Aug. 11	♂	940?	—	—	—	183	?	Tail tip deficient.
289	Sept. 11	♀	1096	—	—	—	181	140	—
290	Sept. 14	♂	1028	—	—	—	183	193	—
291	Oct. 14	♂	928?	15	15	11	182	156	Tail tip deficient.

DRYOPHIS PULVERULENTUS (Dumeril & Bibron.)

Serial No.	Date.	Sex.	Length in mm.	Costals.			Ventals.	Subcaudals.	Remarks.
				Two Head-lengths behind Head.	Midbody.	Two Head-lengths before Vent.			
	1921.								
292	Mar. 17	♂	1282	15	15	11	186	179	—
293	Oct. 5	♂	1122	—	—	—	182	173	Killed on rocky ground in rubber field
294	Nov. 21	♂	1332	—	—	—	187	176	Killed near rocks in rubber field.
295	Dec. 26	♀	1380	—	—	—	—	—	On ground in rubber field. Loreals present (1 + 1). Gravid. Contained three eggs 32 mm. long, with no trace of embryos.

Genus. BUNGARUS.

BUNGARUS CEYLONICUS Günther.

Serial No.	Date.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
	1921.				
296	Mar. 25	568	224	34	Under dead leaves in rubber field. 2nd and 3rd supralabials confluent on right side.
297	Mar. 26	542	227	32	Under dead leaves in rubber field. 2nd and 3rd supralabials confluent on left side.

Serial No.	Date.	Length in mm.	Ventrals.	Subcaudals.	Remarks.
	1921.				
298	June 7	368	224	38	—
299	Do.	380	—	—	—
300	June 8	398	231	36	—
301	Do.	380	224	36	—
302	Sept. 21	678	232	34	Killed at night crossing a path. An <i>Aspidura</i> in stomach, probably <i>quentheri</i> , as there are 15 costals posteriorly, and the subcaudals are 21, entire.
303	Nov. 12	548	229	37	

Genus NAIA.

NAIA TRIPUDIANS Merrem.

Serial No.	Date.	Length in mm.	Costals.			Ventrals.	Subcaudals.	Remarks.
			Two Head-lengths behind Head.	Midbody.	Two Head lengths before Vent.			
	1921.							
304	June 19	442	25	23	15	189	59	
305	Sept. 3	1002	25	23	15	187	59	
306	Dec. ?	364	25	23	15	187	57	

The two juvenile specimens are remarkable for the dark brown dorsal crossbars, about fifteen in number on the body, and the black ventral bars, the latter reducing in the depth of colour from before backwards. The adult is uniformly brown dorsally, but retains the ventral bars seen in youth.

Family **VIPERIDÆ.**Genus **ANCISTRODON.****ANCISTRODON HYPNALE (Merrem.)**

Serial No.	Date.	Sex.	Length.	Ventrals.	Subcaudals.	Remarks.
	1920.					
307	Oct. ?	♂	368	152	45	—
308	?	+	—	155	36	—
309	?	+	262	149	36	—
310	?	—	355	—	—	—
	1921.					
311	May 25	♂	311	146	47	Found among leaves under a log.
312	June 5	+	368	146	36	—
313	June 10	+	184	146	33	—
314	June 21	+	355	148	35	—
315	June 22	♂	362	149	45	—
316	June 30	♂	430	159	47	—
317	July 2	+	336	150	38	—
318	July 5	+	355	146	36	—
319	July 16	+	405	149	38	Found in roof of Sinhalese house.
320	Sept. 21	+	405	151	39	—
321	Nov. 4	—	330	147	33?	Tail tip deficient
322	Nov. 10	♂	380	148	45	Found in damp drain.
323	Nov. 16	+	380	150	40	Gravid. Contained four eggs, probably infertile.
324	Nov. 20	♀	414	151	36	Under rock in rubber field.
325	Dec. 31	+	397	146	39	Gravid. Contained three eggs about 12 mm. long. Found in heavy jungle.

Some light is thrown on the breeding season, the two gravid females being killed in November and December, both in an early stage of pregnancy.

Genus **VIPERA.****VIPERA RUSSELLI (Shaw.)**

A single specimen, 622 mm. in length, was killed on October 10 while crossing a path in a rubber field in the middle of the morning. The ventrals are 175, and subcaudals 51.

A LIST OF THE MAMMALS OF CEYLON.

By W. W. A. PHILLIPS, F.Z.S.

ORDER : PRIMATES.

Sub-order : ANTHROPOIDEA.

FAMILY : *Cercopithecidae*.

MACACA FEROX (THE LION-TAILED MONKEY).

1. *Blanford No. 5, *Macacus silenus*.—A specimen in the British Museum said to have come from Ceylon. Does not seem to be known in the Island.

MACACA SINICA (THE TOQUE MONKEY).

2. Blanford No. 11, *Macacus pileatus*.—Sinhalese, Rilawa ; Tamil, Kurangu ; the Red Monkey. Peculiar to Ceylon. Found in the jungles all over the Island, both in the low-country and hills. Common.

PITHECUS PRIAM (THE MADRAS LANGUR).

3. Blanford No. 14, *Semnopithecus priamus*.—Sinhalese, Vandaruwa ; Tamil, Mundi ; the Gray Wanderoo. Common in the jungles in the Northern, North-Central, Eastern, Uva, and Southern Provinces as far round as Ranna. Not found in the west of the Island. Common in parts of South India.

PITHECUS KEPHALOPTERUS (THE PURPLE-FACED MONKEY).

4. †Blanford No. 17, *Semnopithecus cephalopterus*.—Sinhalese, Kalu Vandaruwa ; Tamil, Mundi ; the Low-country Wanderoo. Peculiar to Ceylon. Common in, and confined to, the jungles of the Western, Southern, and Sabaragamuwa Provinces and ascending into the hills to Adam's Peak.

Note.—A white monkey, *Semnopithecus senex*, of Blanford, has been found in the Island, chiefly in the hills near Matale and near Baddegama in the Southern Province. It was

* "Fauna of British India," Mammalia, Blanford.

† See additions and corrections at end.

recorded by Captain Robert Knox in his book. No specimen has been procured for a number of years, and it is not known whether it should be regarded as a separate species or as a white variety of *P. kephalopterus*. There is a specimen in the Colombo Museum.

PITHECUS URSINUS (THE BEAR MONKEY).

5. Blanford No. 19, *Semnopithecus ursinus*.—Sinhalese, Maha Vandaruwa; Tamil, Mundi; the Up-country Wanderoo. Peculiar to Ceylon. Confined to the hills of the Central Province. Not uncommon in the jungles round the Horton Plains, Bopats, &c., but is persecuted by the Tamils for its flesh and skin.

Sub-order: LEMUROIDEA.

FAMILY: Lemuridæ.

LORIS TARDIGRADUS (THE SLENDER LORIS).

6. Blanford No. 27, *Loris gracilis*.—Sinhalese, Unahapuluwa; Tamil, Theivangu; the Ceylon Sloth. Peculiar to Ceylon. Found sparingly in the jungles or the low-country all over the Island. Has been recorded from near Kandy, but does not ascend the hills to any very great altitude.

ORDER: CHIROPTERA.

FAMILY: Pteropodidæ.

ROUSETTUS SEMINUDUS (THE CEYLON FRUIT BAT).

7. Blanford No. 137, *Xantharpyia amplexicaudata*.—Sinhalese, Wawula; Tamil, Vava. Peculiar to Ceylon. Found locally in various parts of the Island both in the low-country and hills, usually found in large colonies in big caves, but sometimes on trees.

PTEROPUS GIGANTEUS GIGANTEUS (THE COMMON FLYING FOX).

8. Blanford No. 134, *Pteropus medius*.—Sinhalese, Maha Wawula; Tamil, Peria Vava; the Flying Fox. Common all over the low-country wherever there is sufficient fruit, &c., for

it to feed on. Not so common in the south-east where there are large stretches of jungle and little cultivation. Very common round Kandy and up to Nawalapitiya, but rarely seen in the planting districts of Dimbula and Dikoya. Visits Bandarawela (4,012 feet) at night at certain seasons to feed on the flowers of the Gum trees. Spends the day in large colonies hanging from the topmost branches of some large tree. Found in many parts of the Indian Peninsula.

CYNOPTERUS SPHINX SPHINX (THE SOUTHERN SHORT-NOSED FRUIT BAT).

9. * Blanford No. 128, *Cynopterus marginatus*.—Sinhalese, Yakwawula, Wawula; Tamil, Vava; the Small Fruit Bat. Common nearly all over the Island, but uncommon in the Kalutara District. Ascends the hills to some 4,000 feet. Spends the day hanging inside Talipot palm leaves, in the seed-clusters of Kitul trees, or sometimes in holes in trees, either in small parties or singly. Is common all over the Indian Peninsula.

CYNOPTERUS BRACHYOTIS CEYLONENSIS (THE CEYLON SHORT-NOSED FRUIT BAT).

10. Not in Blanford. Sinhalese, Wawula; Tamil, Vava. Peculiar to Ceylon. Only recorded from the Punduloya district (3,500 feet), Central Province.

FAMILY : *Rhinolophidæ*.

RHINOLOPHUS ROUXI ROUXI (THE RUFOUS HORSESHOE BAT).

11. Blanford No. 150, *Rhinolophus affinis*.—Sinhalese, Podi Wawula; Tamil, Sinna Vava. Very common all over the low-country and probably in the hills too. Has been recorded from 4,500 feet. Found in large or small colonies in almost every cave, culvert, or abandoned plumbago pit, not already inhabited by some other species of bat. Also found in disused dwellings, barns, &c. Common in India.

* See additions and corrections at end.

RHINOLOPHUS BEDDOMEI SOBRINUS (THE GREAT INDIAN HORSESHOE BAT).

12. Blanford No. 145, *Rhinolophus luctus*.—Sinhalese, Podi Wawula ; Tamil, Vava. Found very sparingly in the jungles of the low-country. Recorded from Kala Oya and Kalutara. Usually found singly or in pairs in caves or under overhanging rocks in some dark and secluded corner in the jungle. Found in South India.

HIPPOSIDEROS LANKADIVA (THE LARGE MALAY LEAF-NOSED BAT).

13. Blanford No. 161, *Hipposideros diadema*.—Sinhalese, Podi Wawula ; Tamil, Vava. Said to be quite common near Kandy where it lives in large colonies in caves, tunnels, &c., does not seem to have been recorded from any other locality in the Island. Found in the Central Provinces and Mysore in India.

HIPPOSIDEROS SPEORIS SPEORIS (SYKES LEAF-NOSED BAT).

14. Blanford No. 164, *Hipposideros speoris*.—Sinhalese, Kirri Wawula ; Tamil, Sinna Vava. Common over most of the low-country. Lives in large colonies in caves, barns, godowns, &c. Not known whether it occurs in the hills. Common in Southern India.

HIPPOSIDEROS BRACHYOTUS (THE DEKHAN LEAF-NOSED BAT).

15. Blanford No. 163, *Hipposideros galeritus*.—Sinhalese, Kirri Wawula ; Tamil, Sinna Vava. Fairly common over most of the low-country and recorded from Passara (3,000 feet) in the Uva hills. Lives solitary or in pairs and threes in small caves and under overhanging rocks. Found in Central India and Bengal.

HIPPOSIDEROS ATRATUS (THE CEYLON LEAF-NOSED BAT).

16. Blanford No. 166, *Hipposideros fulvus*.—Sinhalese, Kirri Wawula ; Tamil, Sinna Vava. Very common over all the low-country. Not known if it occurs in the hills. Lives

in large or small colonies in caves, culverts, old plumbago pits, lofts of houses, &c., and more rarely in hollow kitul trees. Peculiar to the Island.

FAMILY : Megadermatidæ.

MEGADERMA SPASMA CEYLONENSIS (THE CEYLON
VAMPIRE BAT).

17. Blanford No. 170, *Megaderma spasma*.—Sinhalese, Tutica or Kotikan Wawula ; Tamil, Vava ; the Long-eared Bat. Common in the north and western parts of the Island, very common in Kalutara. Not recorded from the hills. Lives in better built village houses, almost invariably choosing those with a tiled roof—hanging from the rafters. Sub-species peculiar to the Island.

LYRADERMA LYRA LYRA (THE INDIAN VAMPIRE BAT).

18. Blanford No. 169, *Megaderma lyra*.—Sinhalese, Tutica or Kotikan Wawula ; Tamil, Vava ; the Long-eared Bat. Not uncommon in Kalutara, found in small colonies in abandoned houses, caves, or disused plumbago pits. One recorded from Mannar found hanging on a tree, and a few from Colombo found in a house. Found in many parts of India.

FAMILY : Vespertilionidæ.

Sub-Family : Vespertilioninæ.

PIPISTRELLUS CEYLONICUS CEYLONICUS (KELAART'S BAT).

19. Blanford No. 186, *Vesperugo ceylonicus*.—Sinhalese, Kirri Wawula ; Tamil, Sinna Vava. Common in the hills, but rarely descends into the low-country. A few recorded from Kalutara, but not common. Very common in Dimbula and Dikoya, where it is practically the only bat seen flying about in the evening. Lives in small colonies in hollow trees and branches. Sub-species peculiar to Ceylon.

PIPISTRELLUS COROMANDRA (THE COROMANDEL PIPISTRELLE).

20. Blanford No. 187 (partim), *Vesperugo abramus*.—Sinhalese, Kirri Wawula ; Tamil, Sinna Vava. Common in the lower Uva hills (3,000 feet) and in the low-country of the

Northern, Eastern, and Uva Provinces, but does not extend its range into the damper climate of the west coast. Lives in bungalow roofs, hollow trees, &c. Common in many parts of India.

PIPISTRELLUS MIMUS MIMUS (THE SOUTHERN DWARF
PIPISTRELLE).

21. Blanford No. 187 (partim), *Vesperugo abramus*.—Sinhalese, Kirri Wawula ; Tamil, Sinna Vava. The smallest bat in Ceylon. Common in the damper districts of the Western and Southern Provinces, and ascends the hills to Kandy. Lives in small colonies in the roofs of bungalows and other buildings ; and often enters houses. Common in many parts of India.

HESPEROPTENUS TICKELLI (TICKELL'S BAT).

22. Blanford No. 191, *Vesperugo tickelli*.—Sinhalese, Podi Wawula ; Tamil, Vava ; the Golden Bat. Locally distributed. Very common in Kalutara District and recorded from Anuradhapura. Uncommon in Passara (Uva, 3,000 feet). By day hides away in the jungles probably in hollow trees, &c. Found in Central India and Madras.

SCOTOPHILUS KUHLI (THE COMMON YELLOW BAT).

23. Blanford No. 194, *Nycticejus kuhli*.—Sinhalese, Podi Wawula ; Tamil, Vava. Common round Colombo and in the palm belt along the coast of the Western and Southern Provinces, also recorded from Kurunegala and Elephant Pass. Lives in holes in walls and buildings, and possibly in the cadjan roofs of fishermen's huts. Very common in many parts of India.

SCOTOPHILUS WROUGHTONI (WROUGHTON'S BAT).

24. Not in Blanford. Sinhalese, Podi Wawula ; Tamil, Vava. Recorded from Anuradhapura, but seems rare. Found in many parts of India.

LEUCONÆ HASSELTII (VAN HASSELT'S BAT).

25. Blanford No. 203, *Vespertilio hasselti*.—Recorded from Valachchenai Kokoputchi, and Anuradhapura. Found commonly in Java.

Sub-family: Kerivoulinae.

KERIVOULA PICTA (THE PAINTED BAT).

26. Blanford No. 213, *Cerivoula picta*.—Sinhalese, Kirri Wawula; Tamil, Segapu Vava; the Red Bat. Uncommon. Has been recorded from Colombo, Veyangoda, Trincomalee, Peradeniya, and Kalutara. Usually found, two or three together, hanging in the dead leaves on a plantain tree. Found in the Indian Peninsula.

KERIVOULA HARDWICKEI (HARDWICKE'S BAT).

26A. Blanford No. 214, *Cerivoula hardwickii*. Given by Blanford as having been found in the Island, but not known definitely to occur.

Sub-family: Miniopterinae.

MINIOPTERUS FULIGINOSUS (THE LONG-WINGED BAT).

27. Blanford No. 216, *Miniopterus sebreibersi*.—Sinhalese, Kirri Wawula; Tamil, Sinna Vava. Fairly common in the hills of the Uva Province, also recorded from Wellawaya and Kurunegala. Seems to prefer a rather dry climate. Is not found in the damp Western Province. Found in Nepal and the Western Ghats.

FAMILY: Emballonuridae.

TAPHOZOUS LONGIMANUS (THE LONG-ARMED SHEATH-TAILED BAT).

28. Blanford No. 220, *Taphozous longimanus*.—Sinhalese, Podi Wawula; Tamil, Vava. Rather uncommon. As yet only recorded from the Kalutara District. Lives, generally solitary or in pairs (sometimes in threes), in the crowns of the tallest coconut palms, either crawling in behind the leaf stem, or hanging on to the trunk, behind a dead leaf.

**TAPHOZOUS MELANOPOGON (THE BLACK-BEARDED
SHEATH-TAILED BAT).**

29. Blanford No. 218, *Taphozous melanopogon*.—Sinhalese Podi Wawula ; Tamil, Vava. Only recently found in Ceylon ; when a large colony was discovered living in a pile of rocks near Paiyagalla in the Kalutara District. Lives in crevices and crannies under over-hanging rocks. Found in many parts of India and the Malay Peninsula.

**SACCOLAIMUS SACCOLÆMUS (THE POUCH-BEARING
SHEATH-TAILED BAT).**

30. Blanford No. 222, *Taphozous saccolæmus*.—Sinhalese, Podi Wawula ; Tamil, Vava. Common in many parts of the Island, but particularly so in Kalutara. Has been recorded from Passara (3,500 feet) in the Uva hills, but seems to be absent from Dimbula and Dikoya. Flies very high and swiftly. Lives usually in small colonies in hollow kitul palms and other trees. Also found in Java, Kanara, and Bengal.

Note.—One or two other species of bats may, and probably do, occur in the Island, but they have not yet been recorded with any certainty.

ORDER: INSECTIVORA.

FAMILY : Soricidæ.

FEBOCULUS FEBOCULUS (THE LONG-CLAWED SHREW).

31. Blanford No. 119, *Crocidura macropus*.—Sinhalese, Kuni-miya, Hik-miya ; Tamil, Mungi-yelli ; Shrew-mouse. Peculiar to Ceylon. Found round about Nuwara Eliya.

PACHYURA MONTANA (THE CEYLON HIGHLAND SHREW).

32. Blanford No. 117 (partim), *Crocidura murina*.—Sinhalese, Kuni-miya, Hik-miya ; Tamil Mungi-yelli ; Shrew-mouse. Found in the hills of the Central Province.

PACHYURA KANDIANUS (THE KANDY SHREW).

33. Blanford No. 117 (partim), *Crocidura murina*.—Sinhalese, Kuni-miya, Hik-miya; Tamil, Mungi-yelli; Shrew-mouse. Found in the hills of the Central Province. Recorded from Passara (3,000 feet), Uva; and Balangoda (1,750 feet). Sabaragamuwa.

PACHYURA CÆRULENS (THE GRAY MUSK SHREW).

34. Blanford No. 118, *Crocidura cærulea*.—Sinhalese, Kuni-miya, Hik-miya; Tamil, Sinna-yelli; Musk Rat. Quite common in Colombo; has probably been imported; rarely found far from human habitation.

Note.—The authorities at the British Museum have not yet finished revising and working out the genera and species of this family. There will probably be several alterations when more is known.

ORDER: CARNIVORA.

FAMILY: Felidæ.

FELIS PARDUS (THE LEOPARD OR PANTHER).

35. Blanford No. 30, *Felis pardus*.—Sinhalese, Kotiya. Diwiya (male only). Diwidena (female); Tamil, Pilli; the "Cheetah." Fairly numerous all over the more thinly populated parts of the Island, from the highest hills to the Sea coast, wherever there is enough jungle to afford it protection. Common generally throughout the Indian region.

FELIS VIVERRINA (THE FISHING CAT).

36. Blanford No. 35, *Felis viverrina*.—Sinhalese, Andhundiwiya; Tamil, Koddy-pilli; the Tiger Cat. Found sparingly in the jungles all over the Island, both in the hills and low-country, but rarely seen. Has been recorded from many parts of India.

FELIS RUBIGINOSA (THE RUSTY-SPOTTED CAT).

37. Blanford No. 37, *Felis rubiginosa*.—Sinhalese, Walballala; Tamil, Kadu-puna; the Wild Cat. Fairly common

in jungles all over the Island. Is usually found in small patches of heavy jungle, near habitations. Fairly common in South India.

FELIS AFFINIS (THE JUNGLE CAT).

38. Blanford No. 41, *Felis chaus*.—Sinhalese, Wal-ballala, Kalla-diwiya ; Tamil, Kadu-puna ; the Jungle Cat or Wild Cat. Not uncommon in the northern and dry parts of the Island, rarely found south of Colombo, does not appear to ascend the hills. Occurs in many parts of India.

FAMILY : Viverridæ.

Sub-family : Viverrinæ.

VIVERRICULA MALACCENSIS (THE SMALL INDIAN CIVET).

39. Blanford No. 48, *Viverra malaccensis*.—Sinhalese, Urulaewa ; Tamil, Poolu Puna ; the Civet Cat. Common all over the Island, in patches of scrub and jungle. Found all over India, Burma, and the Malay Peninsula.

PARADOXURUS NIGER (THE INDIAN TODDY CAT).

40. Blanford No. 51, *Paradoxurus niger*.—Sinhalese, Uggadewiya ; Tamil, Marum Nai ; the Palm Cat. Common all over the Island. Lives in hollow trees, bungalow roofs, and in holes under rocks. Common in South India.

PARADOXURUS AUREUS (THE CEYLONESE PALM CIVET).

41. Blanford No. 53, *Paradoxurus aureus*.—Sinhalese, Kalawedda ; Tamil, Segapu Marum Nai ; the Golden or Red Palm Cat. Somewhat rare in most parts, but found sparingly all over the Island. Fairly common in Bogawantalawa. Often lives in bungalow roofs. Peculiar to Ceylon.

Sub-family : Herpestinæ.

HERPESTES LANKA (THE COMMON CEYLON MONGOOSE).

42. Blanford No. 60 (partim), *Herpestes mungo*.—Sinhalese, Mukatiya ; Tamil, Kiri or Kiri Pullie ; the Mongoose. Occurs only in the dry Northern Zone where it is not uncommon.

In the west is not found much south of Anuradhapura, though in the east it extends its range down to Palutupana in the Hambantota District. Peculiar to Ceylon.

HERPESTES FLAVIDENS (THE CEYLON BROWN MONGOOSE).

43. Blanford No. 63, *Herpestes fulvescens*.—Sinhalese, Mukatiya; Tamil, Kiri or Kiri Pullie; the Mongoose. Common all over the damper districts of the Island, both in the hills and low-country. Is very common in the planting districts of Dikoya and Dimbula, both among the tea and in small patches of scrub fern. Is not found in the dry Northern Provinces, where its place is taken by the preceding species. Peculiar to Ceylon.

HERPESTES SMITHI ZEYLANICUS (THE RUDDY MONGOOSE).

44. Blanford No. 61, *Herpestes smithi*.—Sinhalese, Hötambaya; Tamil, Kiri Pullie; the Big Mongoose. Fairly common in the jungles over most of the low-country, is more a jungle-loving species than the last. Ascends the lower hills to about 3,000 feet. Is very often seen in pairs in the daytime. Subspecies peculiar to Ceylon.

HERPESTES VITICOLLIS (THE STRIPE-NECKED MONGOOSE).

45. Blanford No. 64, *Herpestes vitticollis*.—Sinhalese, Loco Mukatiya; Tamil, Kiri Pullie; the Badger Mongoose. Used to be fairly common in the higher hills of the Central Provinces; but seems to be rather dying out. Was not uncommon on the Horton Plains and Bopats a few years back. Is not uncommon in the Yala reserve. Is also found in the Nilgiri hills in South India.

FAMILY : Canidæ.

CANIS LANKA (THE CEYLON JACKAL).

46. Blanford No. 69, *Canis aureus*.—Sinhalese, Nariya, Hiwala; Tamil, Narri; the Jackal. Fairly common in most parts of the Island, particularly so in the Hambantota District, where it is comparatively tame. Peculiar to Ceylon.

*FAMILY : Mustelidæ.**Sub-family : Lutrinæ.*

LUTRA LUTRA CEYLONICA (THE COMMON CEYLON OTTER).

47. Blandford No. 92, *Lutra vulgaris*.—Sinhalese, Diya-balla or Mudiya-balla ; Tamil, Nair-nai ; the Otter. Fairly common, but not very often seen, in the rivers, streams, lakes, and paddy fields all over the Island. Its presence can usually be discovered by its tracks in the mud. Sub-species peculiar to Ceylon.

FAMILY : Ursidæ.

MELURSUS URSINUS (THE SLOTH BEAR).

48. Blandford No. 100, *Melursus ursinus*.—Sinhalese, Wal-laha (male), Waelahinni (female) ; Tamil, Karradie ; the Bear. Fairly common in the large jungles of nearly all the low-country, except in the west and south-west. Not uncommon in the north-west above Puttalam. Does not usually ascend the hills to any great altitude ; though in the drought some years ago one was seen in a jungle in the Bopats (5,000 feet). having, most probably, come up in search of water. Common in most of the jungles of the Indian Peninsula.

ORDER : RODENTIA.**Sub-order : SIMPLICIDENTATA.***FAMILY : Sciuridæ.*

PETAURISTA LANKA (THE LARGE GRAY FLYING SQUIRREL).

49. Blandford No. 227 (partim), *Petaurista oral*.—Sinhalees, Hangu (Uva), Hambawa ; Tamil, ; the Large Flying Squirrel. Not common. Found occasionally in the heavy jungles of the south, from Ratnapura to the Yala Game Reserve. Is probably found in some of the jungles of the north and east too ; but does not seem to have been recorded from there yet. Does not ascend the hills to any great altitude. Peculiar to Ceylon.

**PTEROMYS (PETINOMYS) LAYARDI (THE SMALL CEYLON
FLYING SQUIRREL).**

50. Blanford No. 237 (partim), *Sciuropterus fuscica-pillus*.—Sinhalese, Hambawa ; Tamil, . Rare. Has occasionally been caught in the jungles of Dimbula and Dikoya, round Great Western and above the Agras, has also been recorded from Wellawaya. Peculiar to Ceylon.

**RATUFA MACROURA MACROURA (PENNANT'S LONG-TAILED
GIANT SQUIRREL).**

51. Blanford No. 241, *Sciurus macrurus*.—Sinhalese, Dandulena ; Tamil, Peria Anil ; the Rock Squirrel. Fairly common in, and confined to, the heavy jungles of the Central hill range, round Hakgalla, Pattipola, and Bogawantalawa, &c. Is the only Giant Squirrel found in those forests. Sub-species peculiar to Ceylon.

**RATUFA MACROURA MELANOCHRA (THE BLACK AND
YELLOW GIANT SQUIRREL).**

52. Blanford No. 241 (partim), *Sciurus macrurus*.—Sinhalese, Dandulena ; Tamil, Peria Carpu Anil ; the Rock Squirrel. Confined to the damp jungles of the west and south-west from the south side of Colombo to the Udugama district. Sub-species peculiar to Ceylon.

**RATUFA MACROURA DANDOLENA (THE COMMON CEYLON
GIANT SQUIRREL).**

53. Blanford No. 241 (partim), *Sciurus macrurus*.—Sinhalese, Dandulena ; Tamil, Male Anil, Peria Anil ; the Rock Squirrel. Common in the heavy forests of the south, from Ranna ; and round through the Uva and Eastern Provinces to the north, where it spreads over the jungles, as far south as Anuradhapura and Puttalam. Does not seem to ascend the hills. Has been found in Travancore, in South India.

**FUNAMBULUS PALMARUM BRODIEI (THE NORTHERN
CEYLON PALM SQUIRREL).**

54. Blanford No. 253 (partim), *Sciurus palmarum*.—Sinhalese, Lena ; Tamil, Sinna Anil ; the Palm Squirrel. The common palm squirrel of the Northern Zone from about Kurunegala northwards. Sub-species peculiar to Ceylon.

**FUNAMBULUS PALMARUM KELAARTI (THE LOWLAND CEYLON
PALM SQUIRREL).**

55. Blanford No. 253 (partim), *Sciurus palmarum*.—Sinhalese, Lena ; Tamil, Sinna Anil ; the Palm Squirrel. The Palm Squirrel of the eastern and southern low-country.

**FUNAMBULUS PALMARUM FAVONICUS (THE SUB-MONTANE
CEYLON PALM SQUIRREL).**

56. Blanford No. 253 (partim), *Sciurus palmarum*.—Sinhalese, Lena ; Tamil, Sinna Anil ; the Palm Squirrel. The Palm Squirrel of the wet zone, i.e., Kalutara, Galle, and Sabaragamuwa.

**FUNAMBULUS PALMARUM OLYMPIUS (HIGHLAND PALM
SQUIRREL).**

57. Blanford No. 253 (partim), *Sciurus palmarum*.—Sinhalese, Lena ; Tamil, Sinna Anil ; the Palm Squirrel. Common in the hills, both in Dimbula and Dikoya, and in Uva. In the former districts it seems to be rapidly extending its range.

Note.—When more material is to hand and more is known about the seasonal changes of the Palm Squirrel, it is probable that it will be found necessary to revise the numerous sub-species, and do away with some altogether.

FUNAMBULUS LAYARDI (LAYARD'S STRIPED SQUIRREL).

58. Blanford No. 255, *Sciurus layardi*.—Sinhalese, Lena ; Tamil, Sinna Anil. Rare, confined to the Ratnapura and Balangoda Districts, where it lives in the tallest and biggest trees. Peculiar to Ceylon.

FUNAMBULUS KATHLEENÆ (THE NUWARA ELIYA GROUND SQUIRREL).

59. Blanford No. 256, *Sciurus sublineatus*.—Sinhalese, Lena; Tamil, Sinna Anil; the Little Ground Squirrel. Fairly common in the jungles and scrub round Nuwara Eliya and in the tea districts of the higher hills. Seems to prefer tangled bamboo brakes. Peculiar to Ceylon.

FAMILY: *Muridæ*.

Sub-family. Gerbillinæ.

TATERA CEYLONICA (THE CEYLON GERBIL OR ANTELOPE RAT).

60. Blanford No. 264, *Gerbillus indicus*.—Sinhalese, Well-miya; Tamil, Vell-'yelli; the Sand Rat. Fairly common all over the low-country; but does not ascend into the hills. Lives solitary, in pairs, or in family parties, in burrows in sandy soil or in anthills. Is nocturnal and rarely seen by day. Peculiar to Ceylon.

Sub-family: *Murinæ*.

BANDICOOTA MALABARICA (THE MALABAR BANDICOOT).

61. Blanford No. 296, *Nesocia bandicota*.—Sinhalese, Uru-miya; Tamil, Peritche-'elli; the Bandicoot. Not uncommon in swamps and gardens all over the Island, including the hills. Does considerable damage in kitchen gardens. Common in Central and Southern India.

GUNOMYS GRACILIS (THE CEYLON MOLE RAT).

62. Blanford No. 295, *Nesocia bengalensis*.—Sinhalese, Wel-miya; Tamil, Yelli; the Paddy Field Rat. Very common in the paddy fields of the low-country, and in the hills to almost the elevation of Kandy. Burrows into and along the paddy field bunds and does considerable damage to the villager's gardens. Peculiar to Ceylon.

RATTUS KELAARTI (KELAART'S RAT).

63. Blanford No. 272 (partim), *Mus rattus*.—Sinhalese, Miya; Tamil, Yelli, the Rat. Found in the hills only. Peculiar to Ceylon.

RATTUS RATTUS KANDIANUS (THE WHITE-BELLIED TREE RAT).

64. Blanford No. 272 (partim), *Mus rattus*.—Sinhalese, Gay-miya, Nera-miya (Uva); Tamil, Yelli; the Bungalow Rat. Very common all over the Island. The common bungalow rat. Peculiar to Ceylon.

RATTUS RATTUS NEMORALIS (THE LARGE CEYLON TREE RAT).

65. Blanford No. 272 (partim), *Mus rattus*.—Sinhalese, Nera-miya (Uva), Miya; Tamil, Yelli; the Rat. Found sparingly all over the Island, generally in scrub and brush-wood. Peculiar to Ceylon.

RATTUS RATTUS NORVEGICUS (THE COMMON BROWN RAT).

65A. Blanford No. 274, *Mus decumanus*.—Is not uncommon round by the docks in Colombo. Has been brought from Europe in the ships. Grows to a large size.

RATTUS BLANFORDI (THE WHITE-TAILED RAT).

66. Blanford No. 278, *Mus blanfordi*.—In August, 1920, two or three half-grown specimens of this species were taken on Dammeria Group, Passara (3,000 feet), in the Uva hills, where several others have been seen since. This is the only record of its having been found in Ceylon. Found in many places on the Indian Peninsula.

MILLARDIA MELTADA MELTADA (THE SOFT-FURRED FIELD RAT).

67. Blanford No. 290, *Mus meltada*.—Has been recorded from the low-country of the Southern and Uva Provinces only. Is found in the Central and Southern Provinces of India.

MUS DUBIUS (THE COMMON INDIAN HOUSE MOUSE).

68. Blanford No. 282, *Mus musculus*.—Sinhalese, Kosattamiya; Tamil, Sund'elli; the Mouse. Common near human habitations all over the Island; equally common all over India.

LEGGADA BOODUGA (THE SOUTHERN FIELD MOUSE).

69. Blanford No. 287, *Mus buduga*.—Sinhalese, Kosattamiya; Tamil, Sund'elli; the Field Mouse. Found sparingly in the paddy fields all over the low-country. Common in Kalutara. Not recorded from the hills. Lives in holes in paddy field bunds, &c. Found over most of India.

CÆLOMYS MAYORI (MAYOR'S RAT).

70. Not in Blanford. A species belonging to an entirely new genus, peculiar to Ceylon, discovered by Major E. W. Mayor in 1913. Only recorded from Pattipola and the Horton Plains.

CÆLOMYS BICOLOR (THE BICOLOURED CÆLOMYS).

71. Not in Blanford. The low-country representative of *C. mayori*; also discovered by Major Mayor, only recorded from Kottawa in the Southern Province, where it seems to be rare.

VANDELEURIA OLERACEA ? (THE LONG-TAILED TREE MOUSE).

72. Blanford No. 270, *Vandeleuria oleracea*.—Sinhalese, Gaz-miya; Tamil, ?; the Tree Mouse. Very uncommon, has been found at Welimada, in the Yala Game Sanctuary, and in Kalutara on a few occasions only. Found in India.

GOLUNDA NEWERA (THE NUWARA ELIYA BUSH RAT).

73. Blanford No. 299 (partim), *Golunda ellioti*.—Sinhalese, Wel-miya; Tamil, ?; the Coffee Rat. Not uncommon both in the hills and in the southern and western low-country, but not often seen on account of its skulking habits. Was more common, and did much damage in the coffee days.

*FAMILY : Hystrioidæ.*ACANTHION LEUCURUS LEUCURUS (THE INDIAN
PORCUPINE).

74. Blanford No. 315, *Hystrix leucura*.—Sinhalese, Ittewa; Tamil, Mullum pandi; the Porcupine. Fairly common all over the Island. Owing to the damage it does to young rubber plantations, gardens, &c., its numbers are kept down. Common in many parts of India.

Sub-order : DUPLICIDENTATA.*FAMILY : Leporidae.*

LEPUS SINGHALA (THE CEYLON HARE).

75. Blanford No. 319, *Lepus nigricollis*.—Sinhalese, Hawa. Tamil, Mossul; the Hare. Common all over the Island wherever there is enough scrub in which to hide. Peculiar to the Island. The Ceylon representative of the Black-naped Hare of South India.

ORDER : ANGULATA.**Sub-Order : ARTIODACTYLA.***Section : Pecora.**FAMILY : Bovidae.*

BUBALUS BUBALUS BUBALUS (THE WILD BUFFALO).

76. Blanford No. 342, *Bos bubalus*.—Sinhalese, Walharaka, Wal-mimea, Madiya (Bull); Tamil, Erume-mardu, Kardumadu; the Buffalo. Found in the heavy forests of the Southern, Uva, Eastern, Northern, North-Central, and North-Western Provinces, but does not ascend the hills. Was nearly wiped out some years ago by rinderpest; but owing to strict protection for a number of years is again on the increase. Found wild in Assam and Central India.

*FAMILY : Cervidæ.***MUNTIACUS MALABARICUS (THE SOUTH INDIAN MUNTJAC OR BARKING DEER).**

77. Blanford No. 362, *Cervulus muntjac*.—Sinhalese, Olua-muwa, Welli-muwa; Tamil, Mann; the Red Deer. Fairly common in the jungles all over the Island, but seems to prefer the patnas and small "tundus" of jungle on the slopes of the hills. Found in Southern India.

AXIS AXIS CEYLONENSIS (CEYLON SPOTTED DEER).

78. Blanford 368, *Cervus axis*.—Sinhalese, Tit-muwa; Tamil, Pullie Mann; the Spotted Deer. In herds in the jungles and scrub all over the more thinly populated parts of the low-country. Does not ascend the hills. Sub-species peculiar to the Island.

HYELAPHUS PORCINUS (THE HOG DEER).

79. Blanford No. 369, *Cervus porcinus*.—Sinhalese, Gona-muwa, Welli-muwa; Tamil, Mann; the Paddy Field or Swamp Deer. Found only in the Kalutara and Galle Districts on the west coast, from a few miles north of Kalutara to near Kottawa, west of Galle, extending inland only some twenty miles or so from the coast. Is fairly common in some of the swamps and patches of jungle between the paddy fields. Was most probably introduced many years ago, and is not indigenous to the Island. Does not occur in South India, but is found in Bengal and the North.

RUPA UNICOLOR UNICOLOR (THE SAMBHU).

80. Blanford No. 367, *Cervus unicolor*.—Sinhalese, Gona; Tamil, Marri; the "Elk." Scattered throughout the heavy forests of the whole Island from the highest peaks to the seashore. Common in the Indian forests where the antlers of the stag grow considerably larger than they do in Ceylon.

Sub-family : Moschiniæ.*Section* : Tragulina.MOSCHIOLA MEMINNA (THE INDIAN CHEVROTAIN OR
MOUSE DEER).

81. Blanford No. 371, *Tragulus meminna*.—Sinhalese. Meeminna, Wal-miya; Tamil, Sarrugu Mann; the Mouse Deer. Not uncommon in the jungles, large and small, all over the Island, often lives in the jungles and "cheddy" surrounding Sinhalese villages, is common round Colombo. Found in the jungles of South India.

FAMILY : Suidæ.

SUS CRISTATUS CRISTATUS (THE INDIAN WILD PIG).

82. Blanford No. 374, *Sus cristatus*.—Sinhalese, Wal-ura; Tamil, Kardu Pandi; the Wild Pig. Common in suitable jungle and scrub all over the whole Island, seems specially common in some of the Uva hills. Found in most parts of India.

Note.—It may be that this species should be regarded as a sub-species peculiar to the Island *S. c. zeylonensis*.

Sub-order : PROBOSCIDEA.

ELEPHAS MAXIMUS ZEYLANICUS (THE CEYLON ELEPHANT).

83. Blanford No. 332, *Elephas maximus*.—Sinhalese, Aliya, Atha (tusk), Athini (cow); Tamil, Anei; the Elephant. Common in the large forest tracts of the low-country, especially so in the low jungle round Hambantota. A few are still left in the main jungle round the Horton Plains and Bopats, but only number a dozen or so. This sub-species is said to be peculiar to the Island, the Indian elephant being *E. maximus maximus*.

ORDER : EDENTATA.**Sub-order : SQUAMATA.****FAMILY : Manidæ.****MANIS CRASSICAUDATA (THE INDIAN PANGOLIN).**

84. Blanford No. 399, *Manis pentadactyla*.—Sinhalese, Kaballæya; Tamil, Alungu; the "Ant-eater" or "Armadillo." Scattered all over the low-country, but nowhere very common; being strictly nocturnal is rarely seen unless stumbled upon at night. Is found in the Uva hills to 3,000 feet. Occurs in many parts of India.

ORDER : CETACEA.**Sub-order : MYSTACOCETI.****FAMILY : Balænidæ.****BALÆNOPTERA INDICA (THE GREAT INDIAN FIN WHALE).**

85. Blanford No. 377, *Balænoptera indica*.—Occurs off the coast of Ceylon. One washed ashore near Ambalangoda in September, 1894. Grows to 80 or 90 feet, said to be the largest of all animals.

Sub-order : ODONTOCETI.**FAMILY : Physeteridæ.****PHYSETER MACROCEPHALUS (THE SPERM WHALE OR CACHALOT).**

86. Blanford No. 379, *Physeter macrocephalus*.—Said to have been formerly much hunted off the coast of Ceylon. One stranded near Mannar in September, 1889.

COGIA BREVICEPS (THE PYGMY SPERM WHALE).

87. Blanford No. 380, *Cogia breviceps*.—One washed ashore at Moratuwa in 1915, and preserved in the Colombo Museum. Wide distribution in the Indo-Pacific and Atlantic Oceans.

FAMILY : *Delphinidæ*.

PSEUDORCA CRASSIDENS (THE GRAMPUS OR LINCOLNSHIRE KILLER).

88. Not in Blanford. One washed ashore at Moratuwa in 1890.

? **LAGENORHYNCHUS OBSCURUM (THE BEAKLESS DOLPHIN).**

89. Blanford No. 387, *Lagenorhynchus obscurum*.—The skull of one taken in the Palk Straits is said to be in the Calcutta Museum.

TURSIOPS TURSIOPS (THE BOTTLE-NOSED DOLPHIN).

90. Blanford No. 388, *Tursiops tursio*.—One recorded from Puttalam. Probably found throughout the Seas of the world.

? **STENO LENTIGINOSUS (THE SPECKLED DOLPHIN).**

91. Blanford No. 392, *Steno lentiginosus*.—A skull of one obtained at Aripo is in the Museum of the College of Surgeons.

Note.—A number of other Dolphins are found in the Indian seas, but have not been included, as they have not been actually taken off Ceylon.

ORDER : SIRENIA.**FAMILY : *Manatidæ*.**

HALICORE DUGONG (THE DUGONG).

92. Blanford No. 398, *Halicore dugong*.—Sinhalese, Talla mala ? Mudaura ? Taken occasionally in the lagoons off the north-west coast of Ceylon from Puttalam to Jaffna. Found also off the coast of Malabar, Andaman Islands, and the Mergui Archipelago.

Additions and Corrections.

Genus *Pithecus*.

More material having come to hand, Mr. Hinton of the British Museum (Natural History) has worked out anew the Western Ceylon forms of this genus and has come to the following decisions. The name *kephalopterus* having been preceded by the name *vetulus*, the true name of the black form of the species must be *P. vetulus vetulus*; while the pale form he has called *vetulus phillipsi*, thereby necessitating the following alterations in the list.

No. 4. *Pithecus kephalopterus*, the Purple-faced Monkey, should read *Pithecus vetulus vetulus*, the Purple-faced Monkey. Peculiar to Ceylon. Common in troops in the jungles south of the Kalu-ganga, in Kalutara, and throughout all the south-western portion of the Island, to Balangoda in the north-east of its range and about Tangalla in the south-east.

Pithecus vetulus phillipsi, Sub-species peculiar to Ceylon. Found throughout the village jungles around Colombo and in the lower Kelani Valley; and southward to Horana and Panadure, the Kalu-ganga forming the dividing line between the territories of the two sub-species.

Genus *Cynopterus*.

After examination of new material, &c., Mr. Hinton has come to the conclusion that all the Ceylon specimens of this genus are referable to the one species *Cynopterus brachyotus ceylonensis*, and that the true *C. sphinx* is not found in the Island.

No. 9. *C. sphinx sphinx* must, therefore, be eliminated from the list.

St. George, March 5, 1923.

THE MUSCIDÆ TESTACEÆ OF THE ORIENTAL REGION.

(With descriptions of those found within Indian limits.)

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(With eleven Plates.)

THE "*Muscidæ Testaceæ*" of the Oriental Region have been the subject of three papers within recent years.

Bezzi (1911) followed Brauer and von Bergenstamm (1893), but subsequently discovered the errors into which he had been led by so doing, and revised matters in his paper of 1913 (Bezzi, 1913), which must form the basis of all subsequent work on the group.

However, in this paper he dealt specifically only with the species belonging to one of the included genera, *Bengalia*, and it was not until de Surcouf's Memoir of 1920 (Surcouf, 1920 a) that the group as a whole was revised. This revision has been actively criticised by Villeneuve, to which Surcouf replied (Surcouf, 1920 b).

Bezzi, in dealing with the species of *Bengalia*, has followed his usual practice of entirely ignoring the existence of species which he has been unable to recognize, and de Surcouf, in *Bengalia* in particular, has attempted no systematization of the species at all.

It is not the intention of the present paper to attempt to criticise de Surcouf's generic arrangement, his Memoir deals with the whole world, and so can only be adequately criticised in a discussion on world forms, though some of his new genera appear to be founded on very weak separatory characters, but his treatment of *Bengalia* appears to contain a misconception of the type species which is fundamental.

In regard to types, he undoubtedly appears to have had all the material required, but, like Bezzi, he appears to have suffered in his work through paucity of material in series—it is the price paid by the Museum worker in Europe for his enormous advantages in respect of type and literature accessibility.

De Surcouf made a great step in the right direction by recognizing that *Bengalia lateralis* Macquart, was not conspecific with *jejuna* Fb., in which Bezzi had sunk it, but his results in attempting to elucidate the two species are the reverse of my own.

It appears uncertain to which sex Fabricius' type of *jejuna* belonged, but it appears to be a female, and de Surcouf bases his whole separation of the two species on the Fabrician type and a female determined as *jejuna* by Macquart, and, as I shall show, the females of *jejuna* and *lateralis* are, by themselves, practically inseparable. The matter is not helped by Desvoidy's synonym *testacea*, of which the sex is not mentioned (the type, like most of that author's, appears to have perished), neither does Wiedemann's synonym, *torosa*, aid in determination, as the type of that species, again, is a female. As the type of the separated species, *lateralis*, is also female (de Surcouf illustrates the type itself on Plate II., fig. 1, stating in the explanation that it is female), it is necessary to try and separate two closely allied species on female specimens only.

De Surcouf attempts to solve the difficulty of separation by use of the marginal macrochætæ on the apparent third and fourth segments. He states that Fabricius' type and Macquart's determined specimen have these very strong, and that they are lacking in the type of *lateralis*, but it is just here that a series would have shown him the invalidity of this character, the macrochætæ vary in strength in almost every specimen, and if they are lacking, then his generic character, "always present," needs modification.

In his fitting of males to these types he appears to have gone on pure guess work, founded, apparently, on abdominal coloration. He "finds" the corresponding male of *jejuna* in the Museum collection from Java (page 36), though on

page 37 he remarks that he only " considers " this specimen to be the male of that species ! No account is given of the provenance of the specimen which is taken as the male of *lateralis* (page 37), which is unfortunate.

The presence of a second pair of posterior dorso-centrals in the type of *jejuna*, and their absence in that of *lateralis*, proves equally valueless, for, on his own showing, this pair is reduced, though, on the evidence of my own series of both species, its absence in the type of *lateralis* is the result either of reduction to absence in this particular specimen, or of damage (Macquart's types, I understand, are all in bad condition), for it can be distinguished in almost every specimen. As for abdominal coloration, in a series every gradation can be seen between strong marginal banding to the abdominal segments, and the entire absence of such.

No specimens *in cop.* appear ever to have come to hand, and without such the question can never be absolutely settled. but I consider that de Surcouf has got the two males reversed. and that the larger species, with distinct abdominal banding. has the male with the tibial armature 5 : 2, and the smaller species, with pale abdomen, only linear banded if at all, has the male with tibial armature 3 : 0, and de Surcouf's statement that the male with this arrangement is smaller than the Fabrician type bears this out.

The male genitalia are entirely different, as the figures show.

De Surcouf, beyond a bare mention of a few species on page 39 regarding chætotaxy in his generic description, ignores the existence of the other described species of the genus.

Bezzi (1913) tabulates the Oriental species known to him, showing that they fall into three groups :—

1. *Abdomen without discal macrochætæ on apparent fourth segment, hind tibiæ of male not shaggily haired, fore tibiæ armed* 2
- Abdomen with discal macrochætæ on apparent fourth segment, hind tibiæ of male shaggily haired, fore tibiæ unarmed* Group III.

2. *Vibrissal angles high above mouth border*, cheeks fairly broad, genæ with many rows of hairs, mid frontal stripe thickly haired, *prelabrum strongly three-cornered, outstanding*, male fore tibiæ armed 3 : 2, claws very thin, almost bristle-like, parafacialia above without black fleck near base of antennæ, wings hyaline, scarcely somewhat yellowish. . . Group I.
- Vibrissal angles exactly over mouth border*, cheeks very narrow, genæ almost bare, mid frontal stripe shortly and diffusely haired, *prelabrum less projecting*, male fore tibiæ armed towards the middle, claws stronger, wings darkened . . Group II.

These would appear to be natural groups, all the African species falling into the third, but some of the subsidiary characters given for separating Groups I. and II. are very weak, others illusory. The position of the thorns in the tibial armature is of no value, likewise the presence or absence of the parafacial black spot, while the degree of hairiness of the mid frontal stripe and strength of the tarsal claws are subject to degrees of variation rendering them practically valueless. Two new species, presently to be described, however, break down the limits of the two main divisions as defined by Bezzi. Both have discal macrochætæ on the apparent fourth segment, but the hind tibiæ are not shaggily fringed in the males, while the fore tibiæ are armed. I consider the discal macrochætæ, a character common to both sexes, of more value than tibial adornment, and would therefore propose to group the species of the genus according to the characters italicized only. The position of none of the old species is altered, and my three new species fall into groups that they most resemble in their general facies. Group II., with very dark wings, is still apparently confined to the Philippines and Formosa.

Bezzi tabulated eight species, including two new ones, two without names, stating that one of the latter was probably

only a variety. Of these, he records three from the Indian sub-regions. We now know *latro* de Meijère, to be Indian also, making four of his seven known from our area, from which only a Philippine and two Formosan species are unrecorded. To these must be added the now separated *lateralis*, so that five species from the Indian area are defined in his and de Surcouf's papers. But van der Wulp (1896) records thirteen species (as *Ochromyia*), from the Oriental Region, to which must be added *varicolor* Fb.; *favillacea* Wlk.; and *obscuripennis* Bigot, described under other genera, making a total of sixteen species known from the region prior to the publication of new ones by Meijère and Bezzi.

Of these, *Ochromyia fulvescens* Big., is sunk by Surcouf in *Phumosiopsis analis* Mq., though Bezzi suggests that it is a true *Bengalia* possibly identical with his "sp. incert. No. 1." *Ochromyia fasciata* Mq., is a *Zonochroa*, as is also probably *trifascia* Wlk., while the generic locations of the latter's *dioclea* and *spissa* are doubtful.

Fourteen Oriental species therefore remain as belonging to this genus (plus others now added), of which number half have not been definitely recognized in modern times. These are :—

<i>Bengalia labiata</i> R. D.	.. Bengal.
<i>Bengalia pallens</i> R. D.	. Bengal.
<i>Bengalia melanocera</i> R. D.	.. Bengal.
<i>Ochromyia javana</i> Mq.	.. Java.
<i>Ochromyia bicolor</i> Wulp.	.. Sumatra.
<i>Homodexia obscuripennis</i> Big.	.. Ceylon.
<i>Anisomyia favillacea</i> Wlk.	.. Celebes.

If de Surcouf is correct in sinking *fulvescens* in *Phumosiopsis analis*, Bezzi's alternative suggestion that his "sp. incert. No. 1" is *javana* Mq., if proved correct, reduces by one the number of unrecognized species. De Surcouf states that the latter is a true *Bengalia*, but, with the type and Bezzi's 1913 paper in his hand, does not follow up the suggestion.

In regard to the Indian sub-regions only, we are left with four unrecognized species, three by Desvoidy and one by Bigot. The descriptions of the first three are in a publication difficult

of access in India, and are herewith reproduced in full on the chance that some other worker, going over his collection with the present paper, may be able to recognize one or more of them. I have seen nothing like them myself. The description of *labiata* would in part fit *Caiusa indica* Surc., but that species, had it been known to Desvoidy, would almost certainly have been placed by him in his genus *Phumosiæ*. The blue tinge referred to in all of them is unlike anything known to me in *Bengalia*, a genus which contains no metallic species whatever.

BENGALIA LABIATA R. D.

Facie alba, frontalibus rubidis; thorax rubide testaceus, dorso nigro-cyanescente; abdomen testaceo-fulvo incisuris cyanescentibus; alæ basi subflavescente.

Long : 5 lines. Face blanche ; antennes un peu brunes ; côtes du front bruns ; frontaux rougeâtres ; corselet d'un testacé un peu rougeâtre ; avec le dos noirâtre cyané ; ecusson d'un fauve testacé ; abdomen d'un testacé fauve, avec le sommet des segmens un peu cyané ; pattes d'un testacé pâle ; cuillerons un peu obscurs ; ailes assez claires, un peu jaunâtre à la base, et à nervures prononcées. Bengal.

BENGALIA PALLENS R. D.

Similior B. labiatæ ; testaceo pallidior ; thorax dorso scutellæque bruneis ; alis non flavescentibus.

Semblable au *B. labiata* ; corps d'un testacé plus pâle ; dos du corselet et ecusson bruns ; pattes pâles ; point de flavescent aux ailes. Bengal.

BENGALIA MELANOCERA R. D.

Cylindriformis ; antennis nigris ; fronte flavescente ; corpus rubicans ; thorax dorso nigricans ; abdomen zonis aut vittis transversis nigro-cyanescentibus ; pedes pallidi ; alæ subobscuræ.

Long : 4½ lines. Cylindriforme ; antennes noires ; front flavescent ; face blanchâtre ; corps rougeâtre ; dos du corselet noirâtre ; le sommet de chaque segment abdominal offre une ligne transversale d'un noir un peu cerulé. Pattes pâles, ayant un peu de brun ; cuillerons blancs ; ailes un peu obscures. Bengal.

Bigot's *obscuripennis*, placed in a genus otherwise exclusively American, is obviously *jejuna* or *lateralis*. The unique type is a female, so the point must always remain uncertain. From his "*abdomine . . . incisuris nigris*" and "*alis infumatis*" I am inclined to refer it to *lateralis*, which has, on the whole, the wings a shade darker than *jejuna*, whilst the description of the abdomen would suggest more narrow black segmental margins than the bands found in typical *jejuna*. Poulton (1913), in recognizing the species as distinct in a non-systematic paper, gives no reasons for so doing, and there is absolutely nothing in Bigot's brief description which would not fit either of the older species.

Leaving *Bengalia*, we have only de Surcouf's work as a basis, and fortunately he has dealt with the remaining genera more fully, in regard to the species, than is the case with the former genus. Three other genera only are Oriental, *Phumosia*, *Caiusa*, and *Tricyclea* (sub-genus *Zonochroa*).

Van der Wulp lists five species of *Phumosia*, to which must be added *Calliphora papua*, Guérin, and *Ochromyia fulvescens* Big., which, as noted under *Bengalia*, is a synonym of *Ph. analis* Mq., recorded from New Holland, and not included in van de Wulp's catalogue. Bigot's *fulvicornis* is a *Cosmina*, belonging to the Rhiniinæ, not a Calliphorine at all, and so the genus stands thus :—

<i>Phumosia abdominalis</i> R. D.	..	Borneo, Philippines, Moluccas, &c.
<i>Phumosia belvosii</i> R. D.	..	? Timor.
<i>Phumosia analis</i> Mq.	..	New Holland, Moluccas.
<i>Phumosia papua</i> Guér.	..	New Guinea.
<i>Phumosia papouana</i> Big.	..	New Guinea.
<i>Phumosia variegata</i> Big.	..	New Guinea.

The genus is thus seen to be entirely Austro-Malayan, only entering the Indo-Malayan sub-region in its eastern limits in Borneo and the Philippine Islands, and does not concern us in India at all.

Caiusa is a new genus of de Surcouf's, very closely allied to *Phumosia*, and was erected with a single species, to which

another is added here, while de Surcouf reports another undescribed North Australian species in Bezzi's collection.

The African genus *Zonochroa* Br. & Bg., reduced by de Surcouf to a sub-genus of *Tricyclea* Wulp, is represented in the Oriental Region by *Ochromyia fasciata* Mq., from Java and possibly *trifascia* Wlk., from New Guinea, and does not appear in our limits. In addition to these genera I have found it necessary to erect a new genus, *Paradichosia*, for a new species from Sikhim, presently to be described, which is very close to *Adichosia* Surc., from the Australian Region, and *Paratricyclea* Villen., from the Ethiopian, and when the genera of the world again come under revision, may serve to unite all three under Villeneuve's name, with the definition slightly amended.

The five Oriental genera tabulate as follows :—

1. Eyes separated in both sexes, frons hairy ; always a prelabrum noticeable. Facial ridges bristly *Bengalia* R. D.
Eyes contiguous or separated in the male, frons generally bare, if hairy, so are the eyes ; no prelabrum.
Facial ridges bristly or bare .. 2
 2. Facial ridges bare .. 3
Facial ridges bristly .. 4
 3. Sternopleurals 2 : 1. Genal bristles strong *Phumosia* R. D.
Sternopleurals 1 : 1. Genæ with fine hairs only *Caiusa* Surc.
 4. Sternopleurals 2 : 1. Eyes hairy *Paradichosia* gen. nov.
Sternopleurals 1 : 1. Eyes bare .. *Zonochroa* Br. & B.
- BENGALIA.

Omitting the three unrecognized species by Desvoidy, the Indian species tabulate as follows :—

1. Abdomen without discal macrochætæ on fourth segment .. 2
Abdomen with discal macrochætæ on fourth segment .. 5

stripe which varies from well distinct, through only a faint brown coloration, to practically absent. The lateral margins of the second and third, and the whole of the fourth segment, may be shimmering whitish.

Legs ochreous yellow, the last three tarsal joints more or less blackened. Front tibia of male with five pre- and two post-median thorns. Mid femora spinose below apically in male.

Wings clear to slightly grayish. Squamæ yellowish-white with white cilia. Long : $11\frac{1}{2}$ –13 mm.

Redescribed from six males and twelve females from Ceylon, at elevations varying from sea level to 4,200 feet, and one female from Banhar, N. Bihar (H. A. Inglis). It is probable that the unknown life-history covers a long period. The species is common during November and December, and I have two specimens taken in May; it is entirely absent during the south-west monsoon months, the solitary exception being a female from Kandy on August 21, in the Colombo Museum collection. Dissection reveals that the species is oviparous.

BENGALIA JEJUNA var. *QUADRINOTATA* Bigot.

Male, Female.—Head : frons in both sexes about one-third the width of head, the parafrontalia more grayish; face paler, parafacialia shimmering whitish. First two antennal joints brownish ochreous, third darker; base of flagellum ochreous, as is also the proboscis. Palpi pale yellowish-white with black bristles.

Thorax : mesonotum and scutellum dull slaty-brown with very distinct pale lateral margins, with which the pleuræ are concolorous.

Abdomen pale yellowish-brown. Apparent first and second segments narrowly but distinctly black banded posteriorly, the third broadly but irregularly so, the colour extending on to the anterior margin of fourth. Sides of apparent second and third (sometimes all the latter) and all the fourth white shimmering.

Legs femora grayish-black, the lower surface of the posterior pairs more or less yellowish. Remainder yellow with darkened tarsal tips. Armature of male front tibiæ and mid femora exactly as in *jejuna*.

Wings clear, squamæ yellowish-white, with white cilia. Long : 10-13 mm.

The species described above runs to *quadrinotata* Big., by Bezzi's key. Though this was described from Ceylon I have never come across it there, the three specimens in my collection from which the foregoing was drawn up being from Banhar, N. Bihar (H. A. Inglis), being thus, like Bezzi's specimen, from North India. The male genitalia are identical with those of *jejuna*, of which it appears only to be a colour variety. In the single specimen in which the legs permit the examination of the hypoplural fan, this is found to consist of four bristles in an angled row.

BENGALIA LATERALIS Macquart (Plate I., Fig. 7. Plate V., ♂ genitalia).

Male, Female.—Head : frons slightly less than one-third of head, just appreciably narrower in the male, ochreous brown, parafrontalia somewhat paler, face, especially parafacials, paler. Antennæ with first two joints ochreous, third darker ; base of flagellum ochreous, as is also proboscis ; palpi pale yellowish-white with black bristles.

Thorax : mesonotum and scutellum ochreous brown, with paler lateral margins varying greatly in width and distinctness ; pleuræ paler.

Abdomen pale brownish ochreous, the hind margins of the apparent second and third segments very narrowly reddish-brown, of third and fourth very narrowly black. A not very distinct median reddish line on second and third. The fourth segment may be shimmering whitish.

Legs ochreous yellow, the apical darkening of the tarsi less distinct. Male front tibiæ with three premedian thorns only ; and mid femora spinose below, the range extending further and the individual spines stronger than in *jejuna*.

Wings clear to slightly grayish. Squamæ yellowish-white with white cilia. Long : 11-12 mm.

Redescribed from three males and one female from Suduganga, Ceylon, 1,386 feet, between December and April. The female is indistinguishable from some specimens of *jejuna*, but in life appears to stand higher on its legs, more Dexiid-like. As Surcouf points out, many of the modern records of *jejuna* possibly refer to this species, which is probably that illustrated as the former by Howlett, *Ind. Ins. Life.*, Plate LXIX., Fig. 4. The genitalia show strong distinctions from *jejuna*. As stated previously, Bigot's *obscuripennis* is probably synonymous with this species.

BENGALIA HASTATIVENTRIS *sp. nov.* (Plate II., Figs. 8, 9, 10, 13, 14. Plate VI., ♂ genitalia).

Male, Female.—Head: frons orange, darkened vertically, parafrontalia and margins of the ocellar triangle silvery-gray, paler brownish-yellow below, where the frontalia are narrower, face concolorous yellowish, parafacials whitish, as are genæ, the parafacials below the eyes appearing narrowly pale yellowish by contrast. Width of frons one-quarter of head. Prelabrum strongly projecting, the vibrissæ convergent above it.

Thorax: dorsum greenish-gray, with traces of median and admedian dark stripes; scutellum concolorous, sides of both edged pinky-yellowish, and the whole of the humeral region thus coloured, the dorsal gray being greatly narrowed anteriorly. Pleuræ pale brownish.

Abdomen yellowish-brown, hind margins of apparent second and fourth segments very narrowly black. Venter similar. In male from hinder margin of apparent third segment in middle of ventral surface a pair of long, strong, black chætæ, closely appressed to the ventral surface arise and reach to tip of apparent fourth segment. Male genitalia concolorous with abdomen.

Legs yellow, tips of tarsi more or less blackened, hardly so in female. Male front tibiæ with four small black thorns near the middle. Mid femora with a short range of densely set spines near the middle.

Wings clear, slightly yellowish on fore border; *squamæ* pale yellowish-white. Long: 6-8 mm.

Described from a male and six females, all taken on windows, Suduganga, Ceylon 1,386 feet, between January and May of various years. Type male on March 26, 1921, in my own collection.

BENGALIA BEZZII *sp. nov.* (Plate I., Figs. 4, 5. Plate VII., ♂ genitalia).

Male, Female.—Head: frons less than one-third width of head, brownish, lateral margins apparently paler, face similar. First two antennal joints brownish-yellow, third darker; base of flagellum and proboscis brownish-yellow; palpi pale with black bristles. Prelabrum only slightly projecting, vibrissæ on the same level.

Thorax uniform ashy-gray, shoulders and humeral region brownish-yellow, pleuræ pale grayish.

Abdomen black, the whole, except the posterior margins of all segments and base of apparent first, shimmering grayish-white.

Legs: femora dark grayish, yellowish below, remainder pale yellowish with tarsal tips slightly blackened. Male front tibiæ with three premedian thorns, and mid femora spinose below apically.

Wings grayish, *squamæ* yellowish. Long: 8 mm.

Described from a male and two females, taken at Suduganga, Ceylon, 1,386 feet, in November to January, three specimens in four years only. Type male on January 20, 1920, in my own collection.

BENGALIA SURCOUFI *sp. nov.* (Plate II., Figs. 11, 12. Plate VIII., ♂ genitalia).

Male.—Head: frons less than one-third width of head; brownish with gray parafrontalia; face paler. First two antennal joints reddish-brown, third darker; base of flagellum and proboscis reddish-brown; palpi pale with black bristles. Prelabrum only slightly projecting, vibrissæ on the same level.

Thorax grayish, unmarginated; pleuræ concolorous.

Abdomen brown, all segments black banded posteriorly, very narrowly on the apparent first, with a more or less well defined median stripe on the second and third.

Legs yellow, tips of tarsi darkened. Front tibiæ of male with a premedian range of about four small thorns, not at all noticeable; mid femora with a range of strong spines on apical third below.

Wings clear to very slightly grayish; squamæ pale yellowish. Long: 9 mm.

Described from three males from Mungpoo, Darjiling District, March to June, 1920, at elevations of 1,700 to 3,800 feet (G. E. Shaw). Type male on March 24, 1920, in my own collection.

I have much pleasure in dedicating this and the preceding species to the two workers to whose investigations we owe our modern knowledge of the genus.

BENGALIA LATRO de Meijère (Plate IX., ♂ genitalia).

Male, Female.—Head: frons one-third width of head, brownish with paler parafrontalia; face pale. First and second antennal joints reddish-brown, third darker; base of flagellum and proboscis reddish-brown; palpi pale with black bristles.

Thorax: dorsum and scutellum brownish-gray, paler at sides; pleuræ grayish.

Abdomen varying from all black with gray shimmer, leaving only posterior bands to all segments black, to a reddish-brown ground colour, covered with white shimmer, with black posterior bands.

Legs: femora varying from black, with front pair more or less yellow below, to all yellow, the paler legs being correlated with the paler abdomen; remainder of legs pale with tarsal tips darkened. Male front tibiæ with middle third minutely but distinctly spinulose, mid femora spinose below at apex, and hind tibiæ fringed.

Wings grayish, squamæ whitish. Long: 12–13 mm.

Redescribed from five males and four females from the jungle area of Ceylon in my own collection, and a small series from

Colombo in the Museum collection. Does not apparently ascend the hills at all, the highest locality recorded being Habarana (547 feet).

I have not been able to recognize *varicolor*, Fb., at all. Certain of the more reddish specimens of *latro* would run out as *varicolor* by Bezzi's key, but in the series all shades of leg and abdominal coloration can be seen, whilst the genitalia of the extreme forms are exactly similar. Size appears to be very constant, and as *varicolor* is described as a smaller species, I refrain from bringing *latro* under it, though I am of the opinion that such will ultimately prove to be the case.

From the foregoing descriptions it will be seen that the males of all species have the tip of the mid femur spinose below, the character being figured in the case of two of my new species where it is well pronounced. Thus, Bezzi's reference to it in his description of *escheri* brings to light that it is present in varying degree in all species. Another point brought out is that even species such as *latro*, described as having the male front tibiæ unarmed, show, under a high power, a distinct engrossment of the ordinary tibial spinules on some portion of the joint, so that it would certainly seem preferable to base the groups of the genus on the macrochætæ of the apparent fourth segment of the abdomen rather than on the adornment of the male tibiæ.

CAUSA.

The two species of this genus are closely allied, pale forms of de Surcouf's *indica* being somewhat difficult to distinguish from *testacea*, sp. nov., but typical species are amply distinct, and there is always some sign of mid dorsal thoracic darkening in *indica*. The genitalia of the two species are quite distinct, and exhibit such a different type of structure from that found in *Bengalia* that one is inclined to suspect that the group "*Muscidæ testacæ*" is not so homogenous as Bezzi would have it; but until it has been possible for the genitalia throughout the family to be examined, the affinities of the various genera in this respect cannot be pronounced upon. An extended study of this nature I hope to have time to undertake at some future date.

CAIUSA INDICA de Surcouf (Plate X., ♂ genitalia).

Male, Female.—Head: male holoptic for half distance between vertex and root of antennæ, frontal triangle black, parafrontalia dark gray; about six frontals present. Antennæ with basal joints testaceous, third grayish, arista all testaceous, plumosity thicker basally above than elsewhere, and almost absent basally below. Palpi and rostrum of proboscis pale yellow, haustellum black. Upper facets of eyes much larger than lower, the junction occurring at about the level of the second antennal joint, not well defined. Female frons less than one-third width of head, black with ashy parafrontalia; two exterior frontals of which the lower is the strongest. Face gray, a little yellow near epistomal margin, parafacialia silvery. Antennæ rather darker than in male. Otherwise as in male.

Thorax: testaceous, mesonotum with a varying amount of black on disc, always leaving broad testaceous lateral margins. There may be some violet tinge in the black, which is usually shining. Sometimes a narrow median line separates the discal black into two broad stripes, and the intensity of infuscation varies greatly, especially in the male, but is never quite absent. Scutellum testaceous, sometimes slightly infuscated basally. Pleuræ testaceous.

Chaetotaxy: acrostichals 2:2, dorso-centrals 2:4, humerals 3, posthumeral 3, presuturals 1, notopleurals 2, supra-alars 2:1, post-alars 2, a mesopleural fan, sternopleurals 1:1, hypopleurals about 4 in an angled row, scutellars an apical, 3 marginal and a pre-apical pair.

Abdomen testaceous, the apical and sometimes the apparent third segment with a varying amount of black, if shining, with usually a violet tinge, if dull, not so. No definite markings.

Legs testaceous, tarsal tips slightly darkened.

Wings clear, veins yellow, fore margin not tinged. Squamæ yellowish. Long: 6-7½ mm.

Redescribed from seven males and four females from Colombo, on various dates and years, in the Museum collection, and one female from Sudu-ganga in December. The males were mostly taken sitting on tips of leaves of the wild date palm.

The specimens seen by me exhibit certain differences from de Surcouf's description, drawn up from a single specimen of each sex. In my specimens vein III. is not bristly below beyond the node, and there are other slight chætotactic differences. The abdominal colour appears variable.

CAIUSA TESTACEA *sp. nov.* (Plate XI., ♂ genitalia).

Male, Female.—Head: male holoptic on middle third of frons, frontal triangle black, parafrontalia ashy, about six frontals. Face yellowish-gray, parafacialia more silvery-ashy; no carina. Antennæ orange, third joint darkened apically. Flagellum with base orange and remainder black. Palpi orange, with black bristly hairs. Upper eye facets larger than lower, but without line of demarcation. Female frontal width about one-quarter of head, frons black, parafrontalia ashy, not clearly margined above, where the colours blend. Inferior exterior frontal much stronger than the superior. Third antennal joint all darkened. Otherwise as in male.

Thorax and scutellum testaceous, darker in female, with a little silvery pollen on anterior margin, through which sometimes show two submedian lines for a short distance, which do not reach the suture. Pleuræ concolorous, paler than the dorsum in the darker female; sternopleuron with some silvery pollen on lower half. Chætotaxy as in *C. indica* Surc.

Abdomen concolorous with thoracic dorsum, unmarked.

Legs testaceous, the tarsi slightly darkened apically.

Wings clear, fore margin yellowish. Third vein bristly about half way to anterior cross vein above, below only on basal node. Squamæ yellowish. Long: $5\frac{1}{2}$ – $7\frac{1}{2}$ mm.

Described from a male from Emelina Estate, Maskeliya district (4,200 feet), on window, April 3, 1919 (N. K. Jardine), type; a female from Suduganga, Matale District, also on window, May 31, 1920, allotype; and four co-types in the Colombo Museum collection, three males from Kandy. August 19, 1914, and a female from Niroddumunai, Trincomalee District, February 12, 1914. Type and allotype in my own collection.

Though the specimens are not before me, this is almost certainly the species bred by Mr. Ballard, Government Entomologist, Madras, from the egg masses of a frog. These specimens are now with Major Patton.

PARADICHOSIA gen. nov.

Male : eyes closely approximated for half the distance between the ocellar triangle and the base of antennæ, sparsely pubescent. Verticals crossed, long ; about five strong frontals. Frontal lunule nearly as wide as the length of the second antennal joint, which is rather less than one-third the length of the third, which has the apex rounded and the posterior edge somewhat more curved than the anterior. Arista plumose nearly to tip, the hairs of equal length on each side, but much more dense on the upper side basally than elsewhere. Cheeks about one-third the height of an eye. Facial ridges bristly, extending upwards to level of middle of third antennal joint, the vibrissæ arising half way between epistome and tip of antennæ, with one noticeably larger bristle immediately above them. Genal row of many bristles, extending nearly to back of head below the eye, intermingled with hairs of about the same length. Postocular row distinct on upper half of eye, and back of head with numerous fine hairs. Palpi elongate claviform. Proboscis somewhat elongated, the haustellum twice as long as the rostrum, strongly chitinized, the labella small.

Thorax : chætotaxy-acrostichals 2 : 3, dorso-centrals 2 : 3, posthumeral 3, humeral 3, notopleurals 2, supra-alars 2 : 2 (the posterior weak), intra-alars 2, postalar 3 (the interior weak), propleural 1, with a decumbent tuft of bristles below it, mesopleuron with hinder marginal fan of about 8, and some hairs along upper margin and upper half of anterior margin, pteropleuron with some weak bristly hairs, sternopleurals 2 : 1 ; hypopleuron with an angled row of about 8 ; scutellars, an apical (lightly crossed), 3 marginal and a pre-apical pair.

Abdomen with strong marginals to second apparent segment laterally, and on all of third and fourth segments, the latter also with irregular discals.

Wings : costal spine weak. First vein bare, third bristly on basal node only above and below. Last section of fourth vein concave exteriorly. Squamæ bare.

Genotype : *Paradichosia scutellata* sp. nov.

This genus is intermediate between *Adichosia*, de Surcouf, and *Paratricyclea*, Villeneuve, the former being Australian and the latter Ethiopian. It is distinguished from the former by the sternopleurals 2 : 1, and from the latter by the pubescent eyes.

PARADICHOSIA SCUTELLATA sp. nov. (Plate III).

Male.—Head : frontal triangle elongate, black, lightly striated superiorly-inferiorly ; base of antennæ fulvo-rufous. the third joint grayish, darker on outer margin, except basally, Palpi bright yellow with long, black bristly hairs, proboscis very dark brown. Eyes with upper facets slightly larger than the lower ones, without a line of demarcation between them, the weak pubescence pale. All bristles black.

Thorax : dorsum very dark gray, with ill-defined ashy lateral margins. Viewed from in front a median and subdorsal broad black stripes, ill-defined, fading away posteriorly, and widely interrupted at the suture, behind which they are very indistinct ; between the median and subdorsals on each side a pair of fine black lines presuturally. Pleuræ dark gray, prothoracic stigma bright fulvo-rufous. Scutellum with the basal two-thirds dark gray, the marginal third fulvo-rufous.

Abdomen : the first apparent segment black, the remainder grayish pollinose with black spots and lines, *Sarcophaga*-like.

Legs (damaged) : fulvo-rufous, tarsi blackened. Long bristles on hind femora below and hind tibiæ above, a very noticeable one at two-thirds the length of the latter.

Wings slightly smoky, the fore margin yellowish. Squamæ smoky-brown with yellow cilia. Long : 8 mm.

Described from a unique male in fair condition taken at Mungpoo, Darjiling District, between 3,900 and 5,200 feet, on February 5, 1920, by Mr. G. E. Shaw of the Government Cinchona estates, to whom I am greatly indebted for many specimens of diptera from this locality.

As noted by Villeneuve for the related *Paratricyclea stabulans* Bezzi, this species has the appearance of an Anthomyid.

In conclusion I would thank Major Patton, Lecturer in Medical Entomology, Edinburgh; Mr. Bainbrigge Fletcher, Imperial Entomologist; and Mr. Brunetti, of the Indian Museum, for help in respect of literature, without which it would have been impossible for this study to have been undertaken by an isolated worker in the tropics.

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* The date of publication of this Memoir, which will always be of great importance, does not appear on the face of the publication itself. Major Patton informs me that the Author, in a letter to Mr. E. E. Austen of the British Museum, states that it was completed at the moment of the outbreak of the great war, but was not published until 1920.

EXPLANATION OF PLATES.

Plate I.

1. *Bengalia jejuna* Fb., ♀
2. *B. jejuna* F., ♂ head, front view.
3. *B. jejuna* F., ♂ head, side view.
4. *B. bezzii* sp. n., ♂ front tibia.
5. *B. bezzii* sp. n., tip of ♂ mid femur.
6. *B. jejuna* F., ♂ front tibia.
7. *B. lateralis* Mq., ♂ front tibia.

Plate II.

8. *Bengalia hastativentris* sp. n., ♂.
9. *B. hastativentris*, ♂ head, front view.
10. *B. hastativentris*, ♂ head, side view.
11. *B. surcoufi* sp. n., ♂ front tibia.
12. *B. surcoufi* sp. n., tip of ♂ mid femur.
13. *B. hastativentris* sp. n., ♂ front tibia.
14. *B. hastativentris* sp. n., ♂ abdomen.

Plate III.

Paradichosia scutellata gen. & sp. nov., ♂

Plate IV.

Bengalia jejuna Fb., ♂ genitalia.

Plate V.

Bengalia lateralis Mq., ♂ genitalia.

Plate VI.

Bengalia hastativentris sp. nov., ♂ genitalia.

Plate VII.

Bengalia bezzii sp. nov., ♂ genitalia.

Plate VIII.

Bengalia surcoufi sp. nov., ♂ genitalia.

Plate IX.

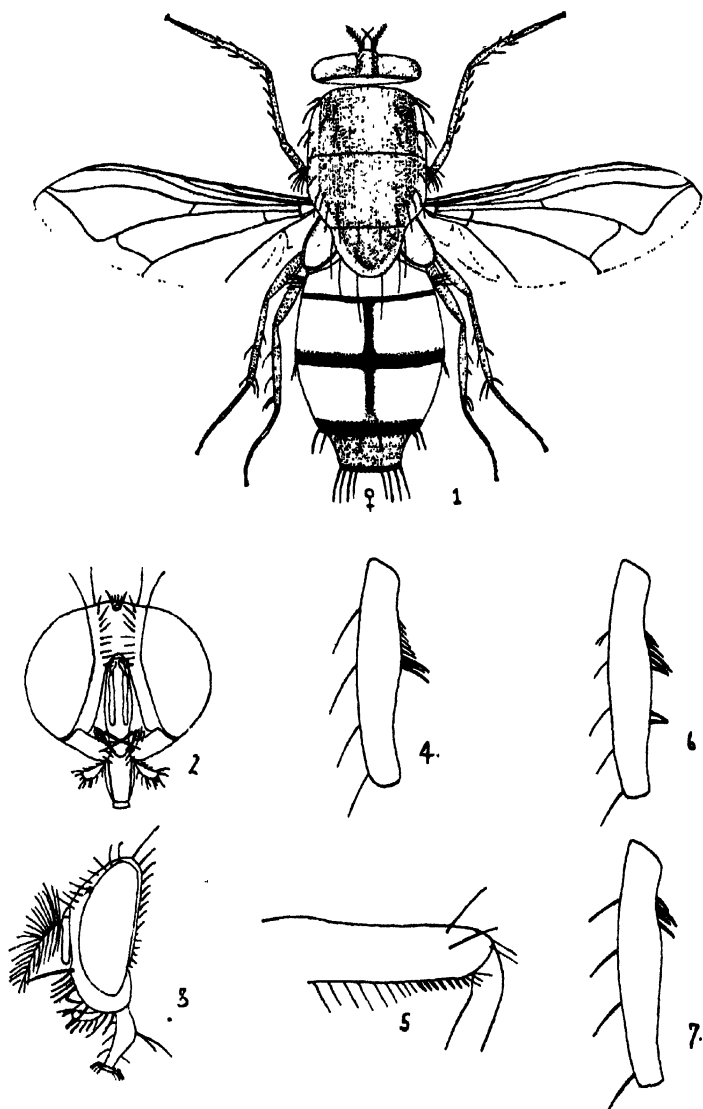
Bengalia latro Meij., ♂ genitalia.

Plate X.

Caiusa indica Surc., ♂ genitalia.

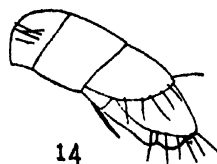
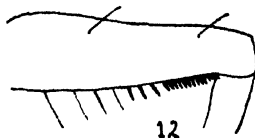
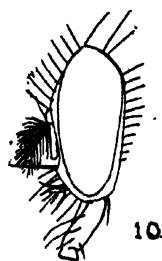
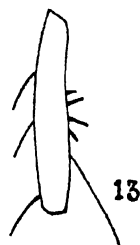
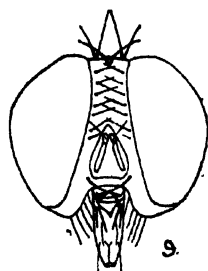
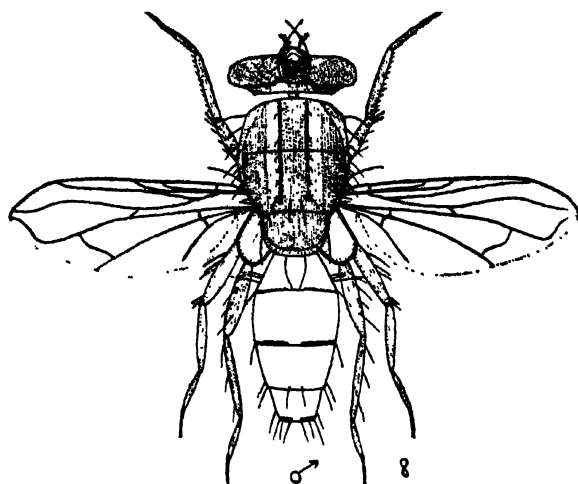
Plate XI.

Caiusa testacea sp. nov., ♂ genitalia.



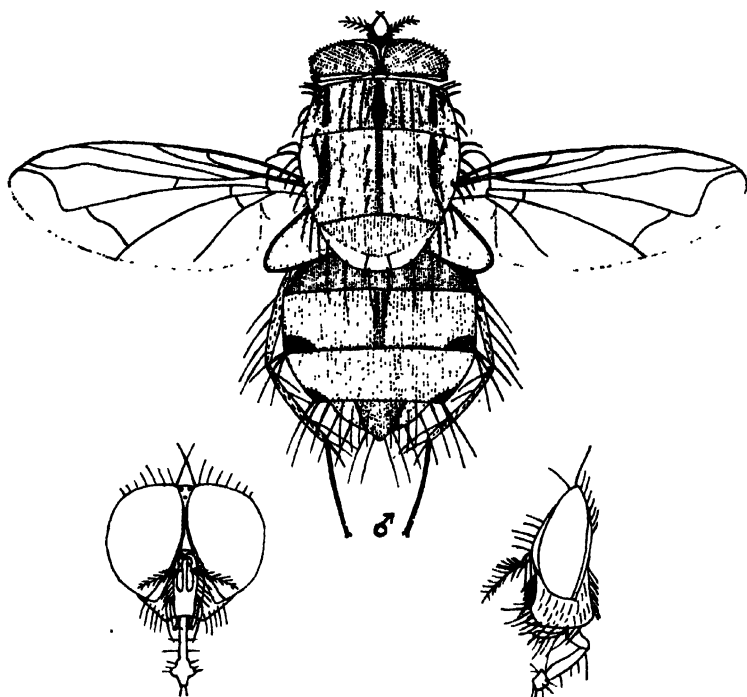
1, 2, 3, and 6 *Bengalia jejuna*.
4 and 5 *B. bezzii*.
7 *B. lateralis*.

R. A. Senior-White, del.



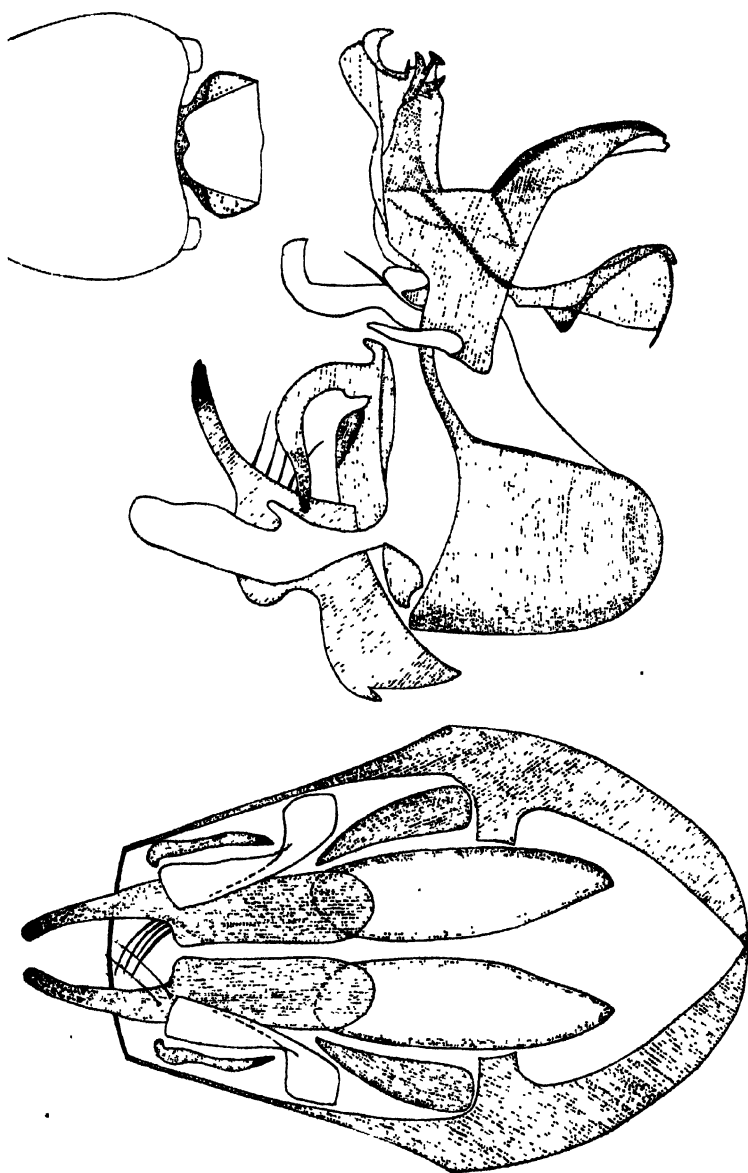
8, 9, 10, 13, and 14 *Bengalia hastativentris*.
11 and 12 *B. surcoufi*.

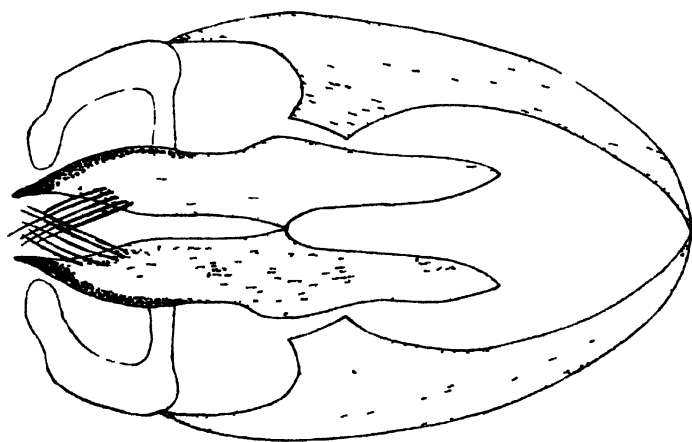
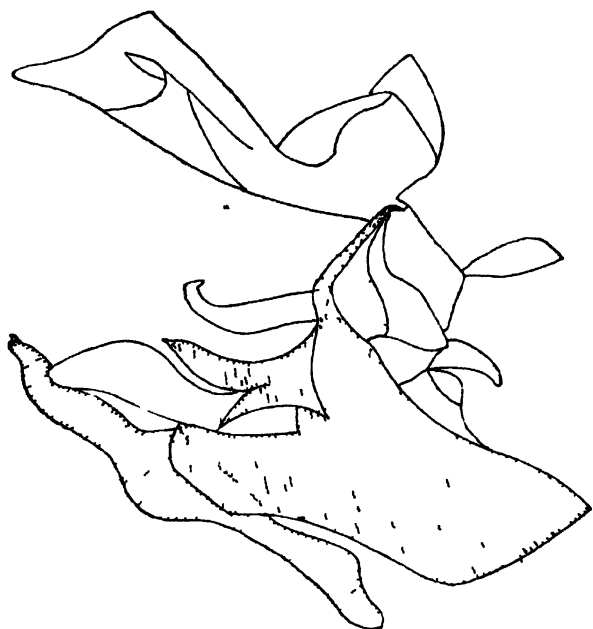
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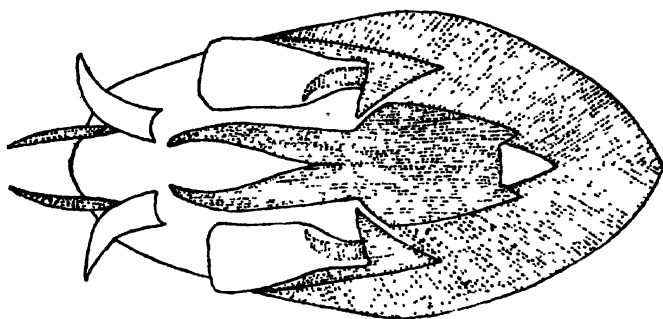
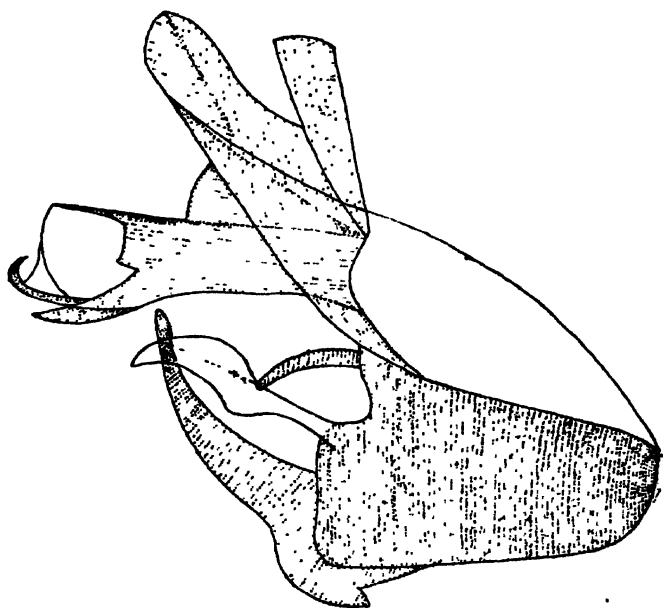
R. A. Senior-White, *del.*

Paradichosia scutellata.



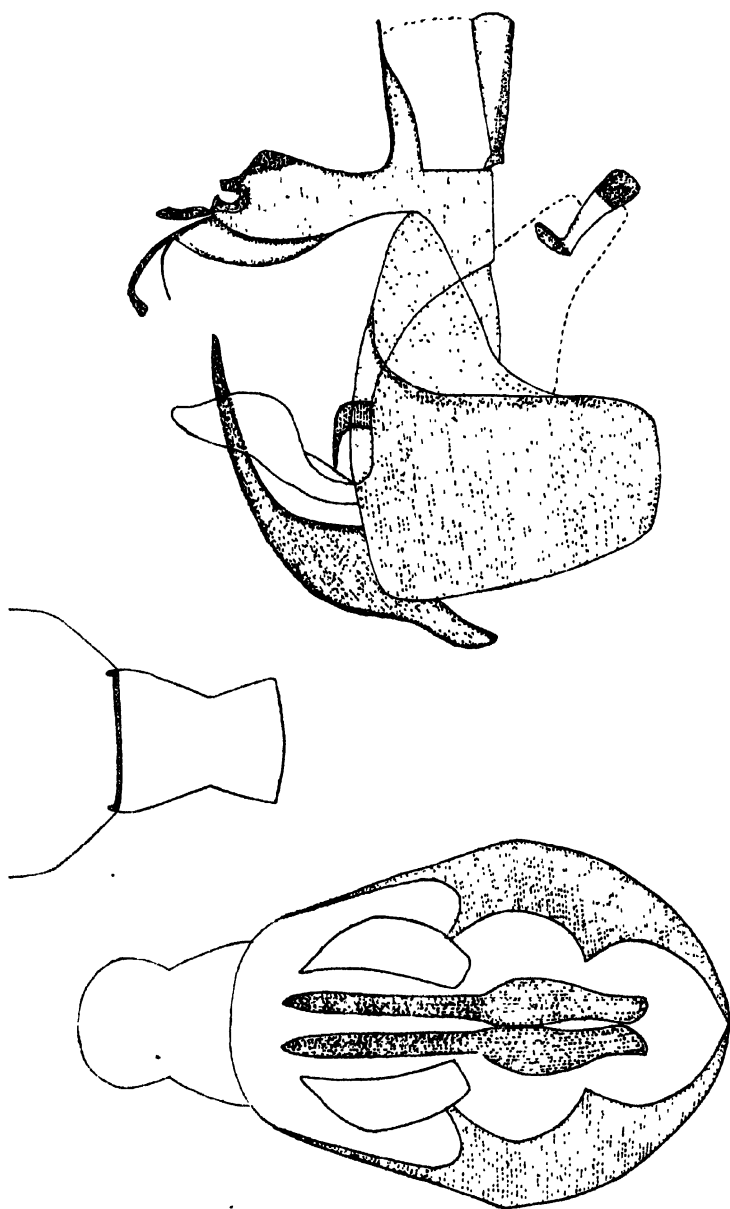


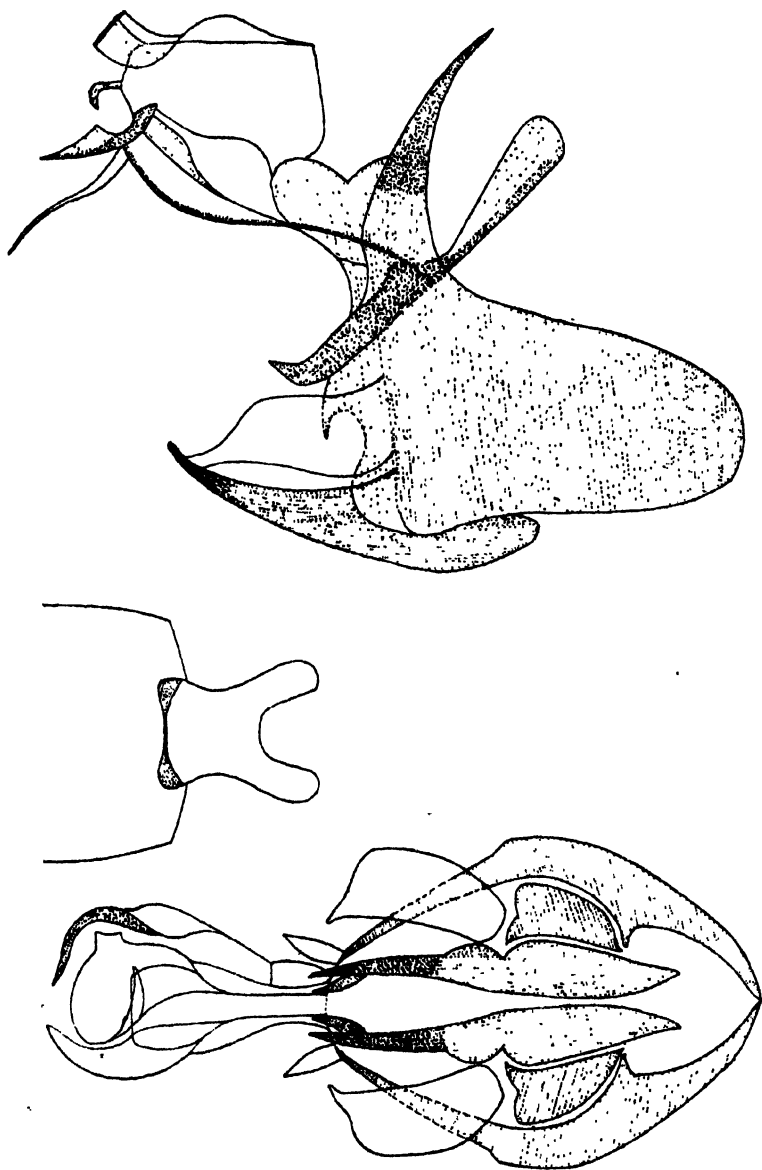
Benqaha lateralis



Bengalia hastativentris.

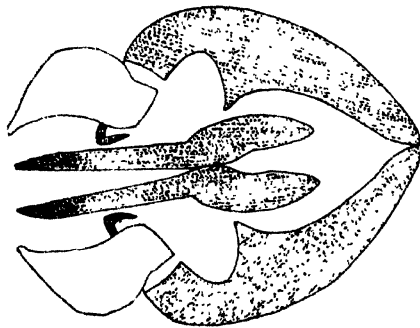
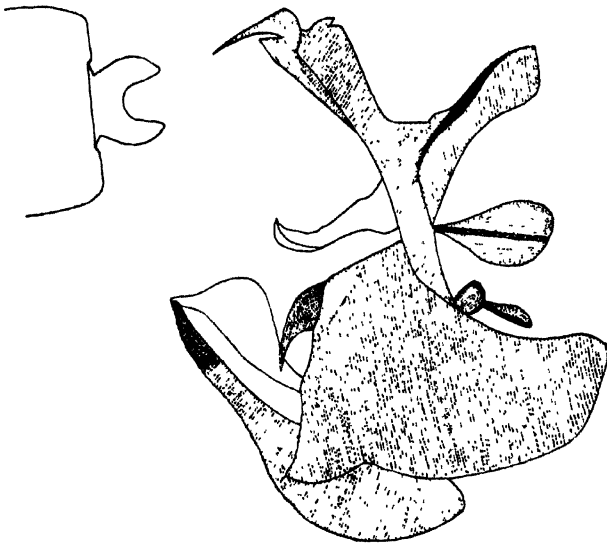
R. A. Senior-White. del.



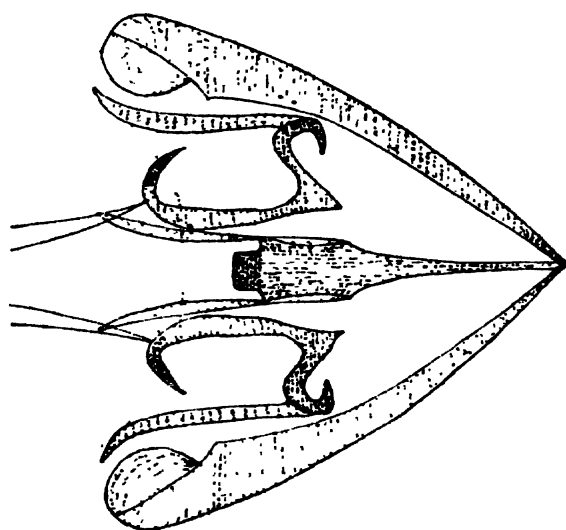
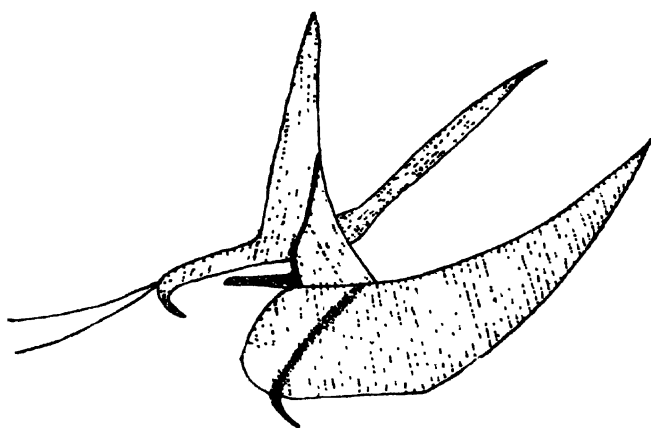


Bengalia surcoufi.

R. A. Senior-White, *del.*

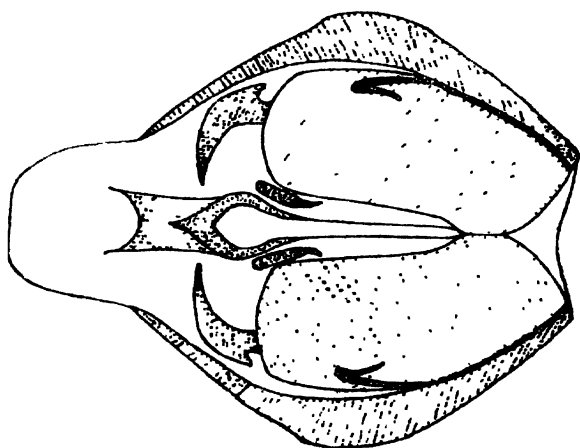
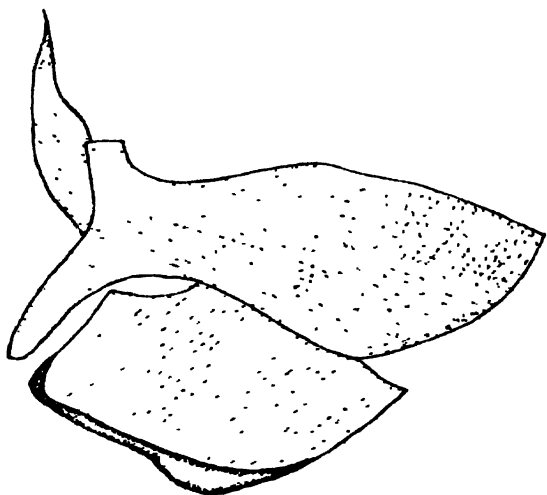


Bengalia latro.
R. A. Senior-White, del.



Caiusa indica.

R. A. Senior-White, *del.*



Caiusa testacea.
R. A. Senior-White, del.

NOTES ON A FEW ABERRATIONS OF CEYLON BUTTERFLIES.

By G. M. HENRY,

Assistant in Systematic Entomology, Colombo Museum.

(With two Plates.)

1. *Cynthia asela*, ♀, *Plate I., Fig. 1.*—This specimen was purchased from a native collector during my absence on leave, and, unfortunately, no definite data as to place, date, or circumstances of the capture were ascertained from him at the time. Apparently, the importance of the specimen was not realized, as it was not set, and on my return I found it amongst a miscellaneous assemblage of butterflies put away in a drawer. The specimen has now been relaxed and set, and is in fair condition.

It may almost be described as a melanism, but in addition to being darker than the normal form, it also differs in the following points: Fore wing, upper side. The transverse discal white band is very much reduced in breadth and disappears almost entirely above vein 6. The proximal portion of the wing is darker than normal. The black, median, transverse line (or rather, series of lunules) is darker and more diffuse, and the post-discal series of black spots is very large and ill-defined. The whole space between the two subterminal zig-zag lines is filled in with brownish-black. The pre-apical white spot is somewhat irrorated with dark brown scales.

Hind wing, upper side. The white band has disappeared altogether, except in interspace 8, its place being taken by the brown ground colour irrorated with greenish-blue of a darker tint than normal. The post-discal series of ocelli is represented by diffuse white spots in interspaces 2 and 5, more or less surrounded by the dark brown of the proximal subterminal zig-zag line which is very much broader and more sharply angulated than in the normal form. The distal subterminal line is absent altogether.

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Fore wing, under side. The 1st and 4th transverse cellular lines entirely absent. The ground colour between the 2nd and 3rd, instead of being darker than between the 3rd and 5th, is lighter, owing to a dark brown suffusion outside the area enclosed by the 2nd and 3rd. The dark transverse discal line is obsolete, its place being taken by a very sinuous, diffuse border to the darker basal portion of the wing. The proximal sub-terminal dark line is similarly obsolescent, while the distal subterminal line is absent.

Hind wing, under side. The upper portion of the disc is occupied by a dark brown diffuse blotch, in which a pale oval mark surrounds the middle discocellular. All the transverse lines are practically obsolete, the distal subterminal being absent, while the others are very diffuse and barely indicated. The ocelli are obsolescent, being represented only by ill-defined white spots. This specimen is numbered 4,027 in the Museum Register of Butterflies.

2. *Papilio polytes* ♀ form *polytes*, Plate II., Fig. 2.—This specimen was bred by me in Colombo, eclosion taking place on September 6, 1921. It is merely a melanism differing from normal in the following points. The discal patch of five white spots on the hind wing is much smaller than usual, the spot in interspace 2 being especially reduced in size, and being closely followed distally by a small transverse red spot. The subterminal red lunules in interspaces 3, 4, and 5 are absent, while those in 1, 2, 6, and 7 are much reduced. The terminal red lunules are obsolete, except in interspaces 1, 2, and 3, where they are very much reduced. In interspaces 4 and 5 they are just indicated. The dusting of blue scales on the hind wing is much reduced.

The under side of the hind wing is similar, but all the orange terminal and subterminal lunules are present though much reduced in size, especially in interspaces 3, 4, and 5. There is no red spot immediately below the white discal spot in interspace 2.

The whole ground colour of the insect is darker than normal. The body, head, and limbs appear to be normally marked. Colombo Museum, Registered Number 4,112.



Fig. 1.
Cynthia asela, ♀ aberration.

E. L. Moses, del.

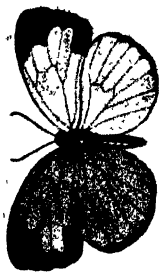


Fig. 2.
Terias hecabe, gynandromorph ?



Fig. 1.
Papilio parinda, ♂ aberration.



Fig. 2.
Papilio polytes, melanism.

3. *Papilio parinda* ♂, *Plate II., Fig. 1.*—This specimen was taken by me at Badulla on April 6, 1922. It was sucking nectar from the flowers in an overgrown Hibiscus hedge that attracted large numbers of the same species daily. Several normal specimens were taken at the same time.

The specimen is slightly deformed, having the left fore wing noticeably narrower than the right.

On the hind wing, upper side, the aberration consists wholly in the complete absence of any trace of the post-discal series of black spots. The subterminal and terminal series are perfectly normal.

On the under side the aberration is more striking. The large basal black area is reduced to a blotch in interspace 1, another in the middle of the cell, and a small smudge in interspace 7. The red space in the basal area is, however, greatly enlarged, occupying about half the normal black area. Distally it shades gradually into the ochraceous blue ground colour, which is normal in tint. The post-discal row of spots is represented by very small, ill-defined spots in interspaces 1, 2, 3, 4, and 5. Otherwise the wing is normal.

The fore wings are normal on both sides as regards colour markings, as are also the head, body, and limbs. Colombo Museum, Registered Number 4,267.

Terias hecabe, *Plate I., Fig 2.*—This specimen, which appears to be a gynandromorph, was taken by me on February 4, 1914, at Niroddumunai near Trincomalee, on the Batticaloa road. Its chief peculiarity lies in the fact that the wings on the right side are considerably smaller than those on the left, and are white in colour instead of yellow. The external genitalia appear to be ♀ in type. Colombo Museum, Registered Number 3,201.

N.B.—In the figure, the difference in size between the right and left pairs of wings is not quite sufficiently indicated.

THE FLEAS OF THE GENUS *XENOPSYLLA* IN RELATION TO PLAGUE.

By L. F. HIRST, M.D., D.P.H.,
City Bacteriologist, Colombo.

PLAGUE first appeared in India in 1896 at Bombay, spread steadily southward over the Peninsula, and finally broke out in epidemic form at Negapatam at the end of November, 1913.

From the beginning, large tracts of country and important cities in India have remained comparatively immune from plague. Islands, as it were, left high and dry in the midst of the epidemic flood. The Cities of Madras and Colombo are in constant communication with all parts of plague-infected India. Yet Madras has only suffered from one small outbreak on the outskirts of the city (1905), which was speedily suppressed. For many years Colombo was thought to be immune from plague. The climatic conditions prevailing in both cities at certain seasons of the year are not unfavourable to plague as was pointed out by Hirst in 1913.

In Colombo both human and rat plague first appeared in Sea street near the harbour in January, 1914. The disease has now become endemic in this quarter of the town. It has been speedily stamped out elsewhere whenever it appeared.

The Plague Commissioners in spite of extended investigations were unable to explain the relative immunity of Madras City from plague. They identified the rat flea of the City as *Xenopsylla cheopis*. Hirst (November 15, 1913) addressing a meeting of the Ceylon Branch of the British Medical Association stated that the rat flea of both Colombo and Madras City was *Xenopsylla astia* exclusively. He produced evidence to show that this flea bites man with reluctance at ordinary Colombo temperature. Subsequently (1917), he reported great difficulty in transmitting plague from rat to rat by means of this new species of flea, first described by Rothschild in 1911.

Hirst found *Xenopsylla cheopis* for the first time in Colombo, shortly after the outbreak of plague, on rats caught in the vicinity of Sea street. This identification was confirmed by

Rothschild in April, 1914. *Xenopsylla cheopis* has been proved by numerous experimenters to be a plague flea and readily bites man. In 1913 Hirst suggested that the relative immunity of Ceylon and parts of Southern India from plague was to be correlated with the geographical distribution of *Xenopsylla astia*. Rothschild (1914) pointed out that the fleas of the Genus *Xenopsylla* occurring on rats in India were divisible into three species:—*X. cheopis*, *X. astia*, and *X. brasiliensis*. *X. brasiliensis* has not yet been found in Ceylon.

Hirst's hypothesis was investigated in India by F. W. Cragg, 1920–1921, who obtained fleas from all parts of India through the agency of the Sanitary Commissioner. Cragg reports as follows (April 20, 1921): "The liability to severe epidemics of plague in those regions in which *cheopis* is the predominant flea, and the absence of such epidemics in regions where *astia* is predominant seem fairly clear." The new hypothesis, therefore, has received strong confirmation. Cragg points out that there is no distinct correlation between difference of climate and the distribution of these fleas.

The distribution of *X. cheopis* and *X. astia* on rats in their relation to plague within the City of Colombo has been specially investigated during 1921–1922. The results are most interesting and may be summarized as follows:—

Hot weather collection, April 1–July 31, 1921, from all parts of the town:—

X. cheopis .. Nil. | *X. astia* .. 551

Cool weather collection. November 24–February 14, 1921–1922:—

	<i>X. astia</i> .	<i>X. cheopis</i> .	<i>Per Cent. cheopis</i>
Plague area ..	791	167	17.43
Non-plague area ..	824	8	0.96
*Sea street (January) ..	169	51	23.18
*Plague house in Seabeach lane (December 14) ..	48	41	46.0

Plague Area: the endemic zone. Non-plague area: rest of Colombo where only sporadic cases occur.

* In centre of endemic zone.

In view of the fact that there is an old under-ground system of untrapped drains in the plague area which harbour *Rattus norvegicus*, one might expect to find *X. cheopis* more numerous upon this species of rat. This is not the case however.

The full details of these observations will be published later. They lend epidemiological support to the view that *X. astia* is not an efficient porter of plague from rat to rat. A small additional collection of fleas from the plague and non-plague zones is being mounted and will be sent to Rothschild for independent examination.

No attempt will be made here to explain this remarkable difference in the distribution of two species of fleas on the same species of rats within the narrow limits of the Municipality of Colombo.

My earlier experiments on the efficiency of *X. astia* as a porter of plague were handicapped by the lack of a supply of individually identified fleas. A few *X. cheopis* might possibly have been mixed with the fleas presumed to be *X. astia*. This, however, in no way detracts from the value of the negative results obtained.

The identification difficulty has been overcome by the use of two distinct methods. Female fleas were allowed to lay their eggs in test tubes. In a few days the mother flea dies of starvation. It can then be removed, mounted, and identified under the microscope. Fleas are bred out from the eggs in a mixture of bran and blood-soaked rag placed at the bottom of the test tube. Each flea can then be placed in a separate tube with a species label. The alternative method is to lightly chloroform the female flea and lay it on its left side on the stage of the microscope, powerfully illuminated from above. The flea can then be distinguished at a glance by the shape of the receptaculum seminalis.

Having obtained a collection of both *X. astia* and *X. cheopis* accurately named by these methods, I have compared the two fleas under similar conditions in two sets of experiments.

(1) Designed to test the readiness with which they bite man; using the same technique as Martin and Chick (1911). The results confirm my earlier conclusion that *X. astia* does not bite man readily.

(2) Designed to test the readiness with which they transmit plague between rat and rat and between mouse and mouse.

All attempts to carry plague between rats, mice, or guinea pigs by means of accurately identified *X. astia* have failed. Seventy-five *X. astia* were used in these experiments.

In a similar series of experiments with only twenty-three *X. cheopis*, plague was carried from mouse to mouse four times during January and February, 1922. The experimental methods were similar to those described in the Plague Commissions Reports (1906) and by Martin and Bacot (1914).

Incidentally, a novel method of transmission of plague by fleas has been experimentally tested and given positive results. Martin and Bacot have shown that mice can be infected by the single bite of a plague-carrying flea, whose gizzard is blocked by growth of plague bacilli. They explain the mode of infection by regurgitation of the blood of the host back into its tissues after contact with the plague growth in the gizzard valve of the flea. I suggest that the most frequent mode of transmission of plague by fleas in nature is the carriage of virulent bacilli in the pharyngeal pump of a blocked flea from a rat newly dead of septicæmic plague to a new host, into whose tissues this virulent blood is regurgitated in the manner aforesaid. Martin and Bacot have produced evidence to show that plague bacilli after growing in the stomach of a flea become less virulent than fresh blood strains.

If the distribution of plague is correlated with the distribution of particular fleas, then it is possible to divide Ceylon and India and their great cities into potential and non-potential plague zones by simply surveying their rat fleas, just as the tropics can be divided into malarial and sleeping-sickness belts on the basis of the distribution of particular winged insects. The energies of the Sanitary Departments concerned can then be concentrated on the danger spots, and made increasingly effective in the war against this terrible disease.

The advances recently made in our knowledge of the epidemiology of plague are the direct result of the labours of two workers, namely, the Hon. N. C. Rothschild and Dr. Karl Jordan, who for many years have devoted themselves in a purely scientific spirit to the study of zoology.

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TWO UNDESCRIBED RHOPALOCERA FROM CEYLON.

By N. D. RILEY, F.E.S.

TAJURIA ARIDA sp. nov.

♂ *Upper Side—Both Wings* : A rather dull frosted grayish-blue. *Fore wing* : The blue confined to areas 1 and 1a from base to within 2 mm. of hind margin, a very small diffuse patch in the base of area 2 and a similar narrow area along the lower edge of cell from base to origin of vein 2 ; the remainder of the wing black and slightly glossy. Cilia shading from black at apex to almost white at anal angle. The veins running through the blue area delicately black. *Hind wing* : The blue occupies the whole wing with the exception of the costal area, the distal half of area 6 and the narrow marginal line, which are black, and the abdominal area, which is light gray, but darker distally. Veins as in fore wing. Close to the margin in area 1c a minute black circular spot ; in area 2 another similar, but very much larger. Cilia gray, white-tipped. Anal lobe pale bluish-gray, with a few dull orange scales against inner margin.

Under Side—Both Wings : Clear pale French gray, with a very fine black marginal line, and crossed by a fine, black post-discal line interrupted at the veins. *Fore wing* : Post-discal line runs from area 7 to vein 1 at an average distance of 3 mm. from hind margin, its sections well separated. Midway between it and hind margin a series of very indefinite, cloudy darker, crescentic markings. Cilia darker than ground colour of wings. *Hind wing* : Post-discal line more prominent than on fore wing, from vein 8 to vein 1a just short of its termination, deeply angulate in area 1c, sub-marginal markings rather more prominent, duplicated, with a paler area between each pair, the black spot in area 2 as above, but surmounted by a much larger, crescentic, proximally black-edged deep

orange-red mark, some gray scaling in area 1c close to post-discal line, anal lobe black crowned with pale blue outwardly, orange-red inwardly.

♀ *Upper Side*.—*Both Wings*: Similar to the ♂, but the blues are replaced by silvery-gray, with only a faint bluish tinge. *Fore wing*: The pale area more extensive than in the male, reaching from inner margin to vein 4, filling the bulk of the proximal half of area 3 and the lower part of cell, in which its upper edge extends in a curve from origin of vein 3 to base; much paler about the base of area 2, almost whitish, its outer edge not approaching hind margin as closely as in the male. *Hind wing*: The black spots in areas 1c and 2 subequal, the post-discal marking of under side represented by broader smudgy lines, otherwise as in the male.

Under Side.—Ground colour very faintly tinged with ochreous; otherwise exactly like the male.

In both sexes the colouration of the thorax and abdomen, above and below, and of the *legs*, agrees with that of the adjacent wing surfaces.

Head black, with a white ring round the eyes, round the base of the antennæ, and a white spot on vertex. *Palpi* white, except for such portions as are visible from above—third and distal half of second joint—which are black.

Antennæ black, the proximal half inconspicuously white ringed, the extreme tip only orange.

Length of fore wing, ♂ 16·5, ♀ 17 mm.

Described from 1 ♂ and 1 ♀ collected by Mr. W. Ormiston at Haldummulla, Ceylon, 3,000 feet, in September, 1918, now in the British Museum Type No. 210 ♂; 211 ♀. There are in addition one ♂ and two ♀ in Mr. Ormiston's collection, all five specimens have been taken at the same time at *Poinsettia* bloom, after a long drought, and in company with *T. cippus*.

These specimens were at first thought to be *T. jehana jehana* as it was obvious they were not *T. jehana ceylanica* from which the darker colouration of the upper side alone at once separates them. *T. jehana* in the male is of a much paler and brighter

blue, the hind margin of the fore wing is slightly excavate posteriorly (decidedly convex in *T. arida*), the club of the antennæ is pale brown, usually with a white streak, and those under side markings, which in *arida* are a deep orange-red, are of a very pale watery ochreous colour in *jehana*.

AMBLYPODIA ABSEUS MACKWOODI, ssp. nov.

A. abseus lanka Evans MS.

♂ ♀.—*Upper Side*.—Colouration as in North Indian (Sikkimese) *abseus*, but with the black borders of both wings reduced to about half the width, i.e., on fore wing about 2 mm. wide at tornus to 5 at apex; hind wing 2-3 mm. in ♂, proportionately in ♀.

Under Side.—The apex of fore wing and the basal and marginal areas of hind wing shiny gray, the bands and spots outlined with paler gray; the spot in area 4 of fore wing not projecting prominently beyond the others in the band.

Described from a pair obtained at Ratnapura, Ceylon, in May, 1915, by Mr. W. Ormiston. Two other males are in the British Museum from the same locality. I have adopted for this form, in preference to Col. Evans' MS name *lanka*, a name suggested by Mr. Ormiston. Mr. Mackwood, who has been intimately associated with the Entomology of Ceylon for upwards of fifty years, was, I believe, the first to obtain this form in the Island.

A. abseus was described by Hewitson (Cat. Lyc., B. M., p. 9, 1862) as coming from Sylhet and Singapore. The description is based on a female, and contains the passage, referring to the under side: "posterior wing lilac in the middle." The specimen figured is in the British Museum, and is a female from Singapore; it is also, of all Hewitson's specimens, the one which agrees best with his description both as to the colouration of the under side of the hind wing and as to the projecting spot in area 4 on the under side of the fore wing. It also bears the label, in Hewitson's own handwriting, which he usually attached only to the specimen he described and, as a rule, figured. In fact, it was his type. It, therefore, unfortunately becomes necessary to accept the narrow-bordered

form which occurs in South Burma and Malacca, and is probably the same as Felder's *amphea* from the Philippines, &c., as typical *abseus*, renaming the North Indian, broad-bordered form *A. abseus indicus* n.n. This arrangement will give us in India, Burma, and Ceylon—

(1) *A. abseus indicus*.—Sikkim and Darjeeling and throughout Burma to Tenasserim ; Siam and Annam.

(2) *A. abseus mackwoodi*.—Confined to Ceylon and much more closely resembling the next subspecies than *A. a. indicus*.

(3) *A. abseus abseus*.—Burma (Pegu, &c.) to Malacca—at least.

The overlapping of *indicus* and true *abseus* in parts of Burma is curious and seems to indicate that we may really be dealing with two distinct species in that area. For several of the details mentioned above I am indebted to MS. notes sent me some while ago by Col. Evans.

NOTES.

Note on the distribution of the Snake Aspidura trachyprocta.—In my book on “The Snakes of Ceylon” (page 213), I included the *Uva patnas* (Lennock estate), within the habitat of *Aspidura trachyprocta*. Mr. Drummond-Hay has written to me that this is a mistake. He has never found this species on the *Uva patnas*, nor anywhere, except at about the elevation of Warwick Estate, Ambawela (5,000 to 6,000 feet).

Karachi, March 5, 1922.

F. WALL.

Notes on Birds of Colombo.—The useful list of Birds of Colombo published by Mr. W. A. Cave in “*Spolia Zeylanica*,” Vol. VIII., page 94, may be augmented by the following species, all of which have been observed by me within Municipal limits :—

Blyth's Reed Warbler (*Acrocephalus dumetorum*).—I have frequently observed this bird during the north-east monsoon, hopping about the trees and shrubs in the Museum compound. As it allowed one to approach quite close I have no doubt of its identity. In spite of its dull colouration, there is no more graceful or charming little bird as it flits actively about in a ceaseless search for insects—every now and then giving vent to a sharp little “chack.”

The Red Woodpecker (*Brachyternus erythronotus*).—This bird is often to be seen in Colombo, flying from one coconut palm to another, and frequently letting off its rattling call, which, incidentally, is very similar to that of the White-breasted King Fisher but slightly higher pitched.

The Common Coucal (*Centropus rufipennis*).—This bird appears to have found its way into Colombo of recent years, as it is now frequently to be seen in Victoria park and the Museum compound, whereas, prior to 1919, I do not recollect seeing it in Colombo.

The Kestrel (*Tinnunculus alaudarius*).—Kestrels are quite common in Colombo during some winters, but other years they appear to be absent. Thus, in January-April, 1921, I could be practically certain of seeing three or four of these birds any day. They take up a regular beat and have one or two favourite perches on which they may usually be found during the heat of the day. One bird frequented the Galle Face, perching either on Christ Church tower or on a cornice of the Galle Face Hotel. A pair occupied Victoria park and perched on the Casuarinas along Green Path. Another bird used the flagstaff of the Sailing Club as its perch and hunted over the open patches of ground among the coal heaps along the harbour-front.

This year (1922), however, I have seen only one Kestrel—hawking over the Royal College grounds.

The Indian Goshawk (*Astur badius*).—It is strange that this bird should have been missed by Mr. Cave, as it is by no means uncommon in Colombo, and a pair breed regularly in Victoria park. I am inclined to think that the record of *Accipiter virgatus* is a mistake for *Astur badius*, as the former is a forest species not at all likely to be found in Colombo.

The Sea-eagle (*Haliaetus leucogaster*).—I have twice observed this fine bird in Colombo. The first occasion was some years ago when I saw one flying along the shore near Galle Face Hotel. Then, on March 23 of this year, I observed another soaring above Union place.

The Lesser Sand Plover (*Ægialitis mongolica*).—In September, 1919, a small flock of these birds haunted the Galle Face for a few days. They made their appearance during a period of heavy rain. Legge records this bird as sometimes appearing on the Galle Face.

The Panayan Tern (*Sterna anæsthes*).—This Tern is not uncommon on the coast of Colombo during the rough weather which ushers in the north-east monsoon. I have seen them

attempting to alight for roosting on the roof of Kollupitiya station. That this bird is but little acquainted with man and his ways is evident from the ease with which it may be caught when it chooses the spars of a ship as a roosting-place. A specimen which I dissected some years ago on the Pearl Banks contained in its crop, amongst other things, a green Pentatomid bug (probably *Nezara viridula*) which it had probably found drifting in the sea. Verily, there is no accounting for tastes !

The Brown Gannet or Booby (*Sula leucogaster*).—Some years ago I observed a Gannet, presumably of this species, flying along the Galle Face. It made repeated attempts to perch on the coconut palm fronds near the Galle Face Hotel.

G. M. HENRY.

REVIEW.

THE SNAKES OF CEYLON.

By Colonel F. WALL, C.M.G., I.M.S.

Newcomers to Ceylon are usually obsessed with the idea that the Island teems with poisonous snakes, and that by unremitting vigilance alone can they be avoided. Although this notion is soon dissipated, every snake is still a venomous reptile, and, as such, to be destroyed at sight. Astonishing ignorance of the nature and habits of these animals prevails in the general community, an ignorance that is well evidenced in the marvellous snake stories that are accepted both in general conversation and in the non-scientific journals. But ignorance may have serious results. Many a native has died, after the bite of a harmless snake, through sheer fright and the conviction that he was a doomed man. Some of the older residents of Ceylon must know the story of the misguided planter who, when bitten on a finger by a "Green Tic," seized a chopper, laid the wounded member on the nearest tree stump, and amputated it with a single blow. It was a plucky act, but an unnecessary mutilation. A better knowledge of Ophiology would have told him that the "Green Tic" (*Trimeresurus trigonocephalus*), though of the most evil appearance, is one of the least venomous of poisonous snakes, and that the consequences of its bite are comparatively trivial.

If the work under review is as widely read as it deserves to be, there should be no further excuse for this prevalent ignorance. The descriptions and most excellent figures are so admirably clear that the identification of any snake becomes child's play. Colonel Wall has the happy gift of lucid exposition and makes even his technical descriptions interesting, while his very full notices of the habits of each species will appeal to every nature lover. He has spared no trouble

to gather all the scattered information that has appeared from time to time in various publications, and has enriched the whole with the product of his unrivalled knowledge of Oriental snakes.

As an instance of the wealth of detail provided, it may be mentioned that the particulars relating to the Python occupy twenty-three pages and that thirty-seven pages are devoted to the Cobra. But all this matter is so well arranged under sub-headings ("General Characters," "Identification," "Colouration," "Habits," &c.), that the reader can find without difficulty any section that he may require.

This book should be in the hands of every Medical Officer, for the sake of the valuable sections on the toxicology of our poisonous snakes. The symptoms and treatment, which vary for the poison of different kinds of snakes, are particularized for each species, and illustrative cases of poisoning are recorded, with clinical notes of each.

A timid person may be relieved to learn that, apart from the marine snakes, with which the ordinary resident is unlikely to come in contact, of the sixty-three terrestrial species described in this work, nine only are venomous. He may also console himself with the knowledge that fatalities from snake bite amongst Europeans are practically unknown. The reviewer can remember but one such case during a residence in the Island of thirty-two years. The European is greatly protected by his clothing. A snake, fortunately, cannot discriminate between the actual body and the garment that covers it. Casualties amongst natives are much larger, as might be expected from their habit of going bare-footed; but it is doubtful if many of the deaths attributed to this cause have been correctly diagnosed.

The author remarks upon the natural timidity of these snakes in confinement, and of their reluctance to bite. It may be observed, however, that the experiments quoted have been conducted during daylight, when a snake is at a disadvantage and appears to realize the fact. They are mostly nocturnal animals, and it is conceivable that they would be more alert and ready to resent interference at night.

Colonel Wall in his Preface anticipates that many new species of snakes remain to be discovered in Ceylon, more particularly on the mountain peaks and ranges, and he appeals for further information and observations. This Monograph (for such it is) should certainly encourage fresh workers in this neglected field.

The addition of very complete and comprehensive indices, and a useful map of the Island showing all the specified localities concludes the work.

I have noticed but a single clerical error, on page 57, where the Spotted Deer, or "Chital" (*Cervus axis*), is referred to as a "Cheetah."

The authorities of the Colombo Museum are to be complimented upon having been the means of presenting such a useful book to the public.

E. E. G.

PROCEEDINGS OF THE CEYLON NATURAL
HISTORY SOCIETY.

Thirty-seventh General Meeting.

THE Thirty-seventh General Meeting of the Society was held in the Colombo Museum Reading Room on Monday, July 11, 1921, at 5.15 P.M. The Hon. Sir Graeme Thomson, K.C.B., in the Chair.

A paper entitled "Biting Flies" was read by Mr. R. Senior-White. Mr. G. M. Henry exhibited a beautiful collection of drawings of Ceylon Birds.

Thirty-eighth General Meeting.

The Thirty-eighth General Meeting of the Society was held in the Colombo Museum Reading Room on Thursday, September 1, 1921, at 5.45 P.M. Dr. Joseph Pearson in the Chair.

New Members:—Colonel Boylan Smith, D.S.O., Mrs. Sinclair, and Miss A. Sinclair.

A paper entitled "Flower Fly Traps" was read by Mr. T. Petch. Mr. G. M. Henry exhibited specimens of Caddis fly larval tubes.

Thirty-ninth General Meeting.

The Thirty-ninth General Meeting was held in the Colombo Museum Reading Room on Tuesday, November 29, 1921, at 9.30 P.M. Dr. Joseph Pearson in the Chair.

A paper entitled "Jungle Byeways" was read by Dr. R. L. Spittel.

Tenth Annual General Meeting.

The Tenth Annual General Meeting was held in the Colombo Museum Reading Room on Monday, February 20, 1922, at 5.30 P.M. Dr. Joseph Pearson in the Chair.

The accounts and report of the Honorary Secretary and Treasurer for 1921 were read and confirmed.

The following office-bearers were elected for the ensuing year:-

Patron : His Excellency the Governor.

President : The Hon. Sir Graeme Thomson.

Vice-Presidents.—Mr. F. M. Mackwood, Dr. A. Nell, Dr. Joseph Pearson, Mr. W. E. Wait, and the Very Rev. Father M. J. LeGoc.

Council.—The Ven. the Archdeacon, Messrs. W. W. A. Phillips, E. C. T. Holsinger, C. T. Symons, F. Lewis, Dr. L. Nicholls, and the Hon. Mr. B. Horsburgh.

Honorary Secretary and Treasurer.—Mr. A. H. Malpas.

New Members :—Messrs. H. R. Freeman, J. A. Henderson, G. Balasuriya, Dr. Flamer Caldera, Messrs. C. Amirthalingam, R. H. S. Schrader, E. Burgess, and H. F. Carter.

Honorary Members :—Col. Frank Wall, C.M.G., I.M.S., and Mr. E. Steuart Baker, President, Ornithologist's Union.

A Paper entitled "Man and the Balance of Nature" was read by Dr. L. Nicholls.

Forty-first General Meeting.

The Forty-first General Meeting was held in the Colombo Museum Reading Room on Wednesday, June 21, 1922, at 6.15 P.M. Dr. A. Nell in the Chair.

A paper entitled "Facts and Fables regarding some Ceylon Birds and Beasts" was read by Dr. R. L. Spittel.

Mr. G. M. Henry gave an exhibition of some aberrations of Common Butterflies.

**A CATALOGUE OF THE DRAGONFLIES (ODONATA)
RECORDED FROM CEYLON, BASED ON MATERIAL
COLLECTED BY Mr. E. E. GREEN, WITH
DESCRIPTION OF A NEW SPECIES.**

BY F. F. LAIDLAW, M.A.,

Corresponding Member, Malayan Branch, Royal Asiatic Society.

IT is close on thirty years since Kirby published his list of the "Dragonflies of Ceylon." That fact and the opportunity of examining an extensive collection, kindly offered to me by Mr. E. E. Green, are my excuses for publishing the present list. It is evident that I have to record nothing very striking in the way of novelties, but I cannot believe that our knowledge of the fauna of this great Island is as yet at all complete. So far as our knowledge goes, the list is more remarkable perhaps for its negative characters than for the number of species which must be noted as endemic to Ceylon.

Thus for the *Aeschninae* we have to note the absence, not only of any member of the *Brachytron* series, but also of *Heliaeschna*: and the relatively poor development of *Gynacantha*—genera one would expect to find well represented. Leaving aside the *Gomphidae* as still too imperfectly known to admit of comment, I may notice in passing that the *Chlorogomphinae* are also missing. In the case of the *Libellulidae* no record can be made of *Macromia* or of *Idionyx* amongst the *Corduliinae*, whilst the *Libellulinae* have no representative of *Lyriothemis*, otherwise a typical Oriental genus; and in general, with only two or three exceptions, the sub-family is represented by a considerable number of common widely ranging species. When we turn to the sub-order *Zygoptera* we find that the *Calopteryginae* and *Epallaginae* so richly represented in North-east India have but few representatives, *Rhinocypha* is absent, but is found everywhere else in suitable areas throughout the region; the sub-family *Megapodagrioninae* is absent and the *Platynemis* series of the *Platyneminae* (*Colliccia*, &c.) is only represented by the almost ubiquitous *Copera marginipes*.

Some, but by no means all, of these negative features Ceylon shares with the Nilgiri Hills, the latter however have *Orogomphus* amongst the *Chlorogomphinae* and *Idionyx* for the *Corduliinae* as well as two *Rhinocyphas*. Their fauna too has special characters of its own, which differentiate it from that of Ceylon as well as from other parts of the Orient.

Positive features of the Ceylon dragonfly fauna are briefly summed up as follows. :—

Firstly, the existence of a number of peculiar species of the *Platystictinae*, a very remarkable and probably very ancient group of *Zygoptera*. Secondly, the possession of several endemic species of *Disparoneura*. Thirdly, a localized development of *Lestes*; and, fourthly, the possession of a certain, rather small, number of species apparently confined to the Island, but belonging to genera well represented elsewhere in the region; the most noteworthy of these is perhaps *Pseudophaea splendens*.

Lastly, we may note the occurrence of a few species which seem to point to a relationship with Malaya, *e.g.*, *Micromerus* spp., *Cratilla lineata*, *Indothemis limbata*, and again *Pseudophaea splendens*.

These characters, both positive and negative, be it clearly understood, are liable to modification as the result of future discoveries.

A remark is necessary on the classification adopted, as this departs somewhat from that usually employed.

I have erected a family *Gomphidae* for those genera usually placed in the *Aeschnidae* in the sub-family *Gomphinae*, because I feel that the sub-ordinate position usually given to them in the *Aeschnidae* is largely a matter of traditional usage, and that their structure both in larval and adult stages is so distinct from the *Aeschninae*, that they are fully entitled to stand apart from the latter.

I use the expedient of brigading the *Zygoptera* into a number of sub-families. I cannot bracket any of these under family headings, and though some of the sub-families may ultimately come to rank as families, I do not think it advisable to give them that rank at present or until more is known of the

phylogeny of the order. The sub-families named agree substantially with those recently suggested by Kennedy and are in accordance with venational characters of the adult, and so far as is known with larval structure as well.

References to Literature.—I have given as few as possible. For the *Libellulinae* the great monograph of Dr. Ris is a sufficient reference except in a very few cases. For other groups Kirby's catalogue is often sufficient, any other that may be required I have, I think, given under the heading of the species.

Kirby's paper "Catalogue of the described *Neuroptera Odonata* (Dragonflies) of Ceylon with Description of New Species," Journ., Linn. Soc. London. Zool., XXIV., pp. 545-566, Pl. 41-42, 1893, is the work on which the present account is based, and has been freely consulted in connection with it. For convenience this is referred to as Kirby. "Dragonflies of Ceylon."

Species not recorded in Kirby's list are marked in this paper with an asterisk (*). Those not included in Mr. Green's collection are indicated by a cross (†).

SUB-ORDER : ANISOPTERA.

FAMILY : *Aeschnidae*.

Aeschninae.

For this sub-family, in addition to Kirby's paper already quoted, the following papers may be consulted :—

- 1909-1913 .. Martin, R.—"Collections Zoologiques due Baron Edm. de Selys Longchamps," fasc. 18-20, Aeschnines.
- 1921 .. Laidlaw, F. F.—"A list of the Dragonflies recorded from the Indian Empire," Pt. IV., Records of the Indian Museum, XXII., Pt. II., pp. 75-91.
- 1921 .. Fraser, E. C., Major—"Indian Dragonflies," Pt. XI., Journ. Bombay Nat. Hist. Soc., 1921, pp. 107-122.

1.—* *ANAX IMMACULIFRONS* (Ramb.).

A. immaculifrons Kirby, Cat. Odonata, p. 84; Fraser, *op. cit.*

1 ♂ Hakgala, August, 1911. 1 ♀ Kandy, September.

Not recorded hitherto for Ceylon. Ranges over Peninsular India, whilst a geographical race has been recorded by Dr. Ris from Hong Kong. Apparently does not occur in Malaya.

2.—*ANAX GUTTATUS* (Burm.).

A. guttatus Kirby, Cat. Odonata, p. 84; Laidlaw, *op. cit.* ; Fraser, *op. cit.*

1 ♂ Kandy, May 12, 1910. 1 ♂ Dambulla, June, 1911, 2 ♂♂ Peradeniya, December 5, 1912 (caught at light).

1 ♀ Galagedara, January, 1910, 1 ♀ Kandy, December, 1910

The species has a wide range, from the Seychelles Islands to the Pacific.

3.—† *ANAX* (*HEMIANAX*) *EPHIPPIGER* (Burm.).

Hemianax ephippiger Kirby, Cat. Odonata, p. 85; Fraser, *op. cit.*

I have not seen examples from Ceylon. Very common in India, ranging to the Mediterranean.

4.—*GYNACANTHA HYALINA* (Selys).

Acanthagyna subinterrupta Kirby, "Dragonflies of Ceylon," p. 558. Text. fig. 40; *Gynacantha hyalina*, Ris., Suppl. Entomol. No. 5, 1916, pp. 59–60; *Acanthagyna hyalina*, Kirby Cat. Odonata, p. 95.

1 ♀ Chilaw, January, 1910.

This is the only species that I know as certainly found in Ceylon, assuming, of course, that my identification is correct. The species is closely related to *sub-interruptor* (Ramb.), but the latter is, I believe, a more easterly ranging form found from Java to Papua, whilst *hyalina* occupies a wide area embracing India, Indo-China, and the Philippine Islands.

Gynacantha furcata Ramb. I have not seen.

FAMILY : Gomphidae.

Sub-family : Gomphinae.

Apart from the references given in Kirby's catalogue there is no account as yet published dealing with the Indian species of the sub-family. I have an account of them now in the press awaiting publication in the "Records of the Indian Museum."

Species from Indo-China are dealt with by Dr. Ris in two important papers.

1912 "Neue Libellen von Formosa, Südchina, Tonkin und den Philippinen." *Supplementa Entomologica* No. 1., Berlin.

1916 "Odonata—H. Sauter's Formosa-ausbeute" *Supplementa Entomologica*, No. 5, Berlin.

5.—*ICTINUS RAPAX* (Ramb.).

Ictinus rapax Kirby, Cat. Odonata, p. 77 ; Kirby, "Dragonflies of Ceylon," p. 558.

2 ♂♂ Kandy, May.

These specimens resemble examples from the south of the Peninsula in having the pale markings on the metepisternite nearly obsolete, leaving the side of the thorax with only two widely separated pale bands.

6.—† *HELIOGOMPHUS NIETNERI* (Selys.).

Anisogomphus nietneri Kirby, Cat. Odonata, p. 69 ;
id. "Dragonflies of Ceylon," p. 557.

I have not seen specimens from Ceylon. The species occurs also in Assam ; I have examined a pair from the Garo Hills. Other species of the genus are recorded from Tonkin and S. China and from the Malay Peninsula.

For the genus *Heliogomphus* I must refer to the paper as yet unpublished in the Records of the Indian Museum.

7.—* *MACROGOMPHUS ANNULATUS* Selys. ?

Macrogomphus annulatus Kirby, Cat. Odonata, p. 63

Fraser, Rec., Indian Museum, XVI., Pt. VII.,
pp. 461–462.

2 ♀♀ Haragama, August, 1903, July 18, 1910

An addition to the fauna. These specimens show some differences from examples in my collection from Poona.

The black on the upper lip is much more extensive in the specimens from Ceylon, the post-clypeus is almost entirely black with two very small yellow spots. There is no yellow spot on the occiput. The yellow stripe on either side of the mid-dorsal carina of the synthorax is narrower and does not reach to the level of the ante-alar sinus, and the small superior spot just inside the humeral suture found in the specimens from Poona is obsolete.

8.—* *MESOGOMPHUS LINEATUS* (Text Fig. 1.)

Lindenia lineata Kirby, Cat. Odonata, p. 59.

1 ♂ Kandy, July 11, 1910. 1 ♀ Peradeniya, April 27, 1911.

This species like *capricornis* Forster of the Malay Peninsula, is undoubtedly congeneric with the African species referred by Ris to *Mesogomphus*. The genus is not very sharply separated from *Onychogomphus*, but the secondary male characters indicate that it is a natural little group.

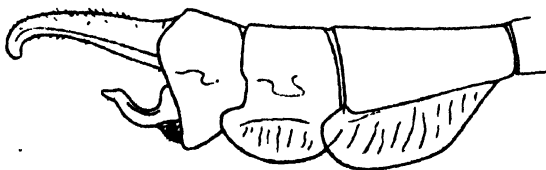


FIG. 1.—Terminal segments of abdomen of *Mesogomphus lineatus*.

Lineatus has a wide range in India and seems to be a common species. The Ceylon specimens show certain colour

peculiarities which may be sufficient to define a geographical race. These characters are as follows :—

- (i.) A well marked black band along the top of the vertical part of the frons with clearly defined T-shaped mark on the horizontal part.
- (ii.) A black band along the suture between the ante- and post-clypeus.
- (iii.) Space between posterior ocelli dark brown.
- (iv.) Yellow line on dorsum of synthorax immediately dorsal to humeral suture interrupted, having only an upper and lower vestige.
- (v.) Lateral black band of synthorax marked with vestiges of yellow spots only, instead of being almost completely interrupted by a yellow line.

For the characters of *Mesogomphus* see Ris. "The Odonata or Dragonflies of South Africa." Annals of the South African Museum, XVIII., part III., pp. 343 and 29.

In my paper on Gomphines above alluded to I have included this species in the genus *Onychogomphus*; it is better referred here.

9.—*CYCLOGOMPHUS HETEROSTYLUS Selys. (Text Fig. 2.)

Cyclogomphus heterostylus Kirby, Cat. Odonata, p. 69.

1 ♀ Kandy, May 1911.

I have compared this specimen with a female from Poona, received from Major Fraser, and can find no difference.

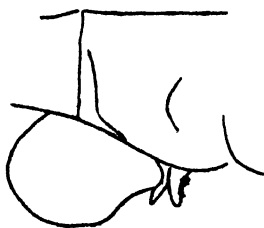


FIG. 2.—Lateral view of the genital structures of the second abdominal segment of *Cyclogomphus heterostylus* ♂ (specimen from Poona).

10.—*† *HETEROGOMPHUS* sp.

A fine male in the British Museum collection taken by Col. Yerbury is the type of this species, the description of which will be published in my paper on Indian Gomphines already referred to. The specimen was apparently overlooked by Kirby as it was mounted along with examples of *Ictinus rapar*, to which species it bears some resemblance. It is quite distinct both from the Himalayan and from Malayan species. Major Fraser tells me (*in litt.*) that he has taken a *Heterogomphus* in the Nilgiri Hills; this may be identical with the Ceylon form.

11.—† *GOMPHUS*? *CEYLANICUS* Selys.

Aeshna (?) *ceylanica* Kirby, Cat. Odonata, p. 68.

The species is known only from the type which I have not been able to examine. The position is doubtful.

*FAMILY: Libellulidae.*Sub-family: ***Cordullinae.***

For this sub-family reference may be made to Martin's Monograph in the "Collection Zoologiques du Baron Edm. de Selys-Longchamps" Fasc. XVII., Bruxelles, 1906, and to Fraser's account of "Indian Dragon Flies," Pt. X., in the Journal, Bombay Nat. Hist. Society, 1921, pp. 673-692.

12.—*AZUMA CYANOCEPHALA* (Hagen).

Epophthalmia cyanocephala Kirby, Cat. Odonata, p. 54,

Id. "Dragonflies of Ceylon," p. 557.

1 ♂ ad, May. 2 ♀♀ teneral. Kandy, September, 1911.

Closely allied to *E. vittata* (Burm.) from the mainland this species is, I think, sufficiently distinct to deserve a specific name. It is one of the largest and handsomest of the Libellulidæ.

♂ Abd. 50 + 2.5 mm., N. W. 47.5 mm.

♀ Abd. 53 mm., N. W., 50 mm.

The female specimens are both teneral, their colouring seems to differ, but little from that of the male. The wings, however, are marked with a smoky-brown in the costal and

sub-costal spaces as far as the arculus, and in addition have a golden-yellow tinge from about half-way between the nodus and pterostigma to the apex.

Sub-family : **Libellulinae.**

The only reference needed for this sub-family is to Ris's Monograph of the Libellulinae in the "Collections Zoologiques du Baron. Edm. de Selys Longchamps," fasc. 9-16, 1909-1920.

Where Ris's nomenclature differs from Kirby's I have added the specific name given by the latter in the "Dragonflies of Ceylon."

13.—**TETRATHEMIS YERBURYI** Kirby.

Tetrathemis yerburi Kirby, "Dragonflies of Ceylon,"
p. 556. Pl. XLI., Fig. 4.

1 ♀ Hatton, May, 1911.

A species recorded only from Ceylon. The genus ranges from tropical Africa to North Australia.

14.—† **HYLAEOTHEMIS FRUHSTORFERI** (Karsch).

Tetrathemis fruhstorferi Kirby, "Dragonflies of Ceylon,"
p. 556.

Originally described from Ceylon, this species has lately been found by Major Fraser in the Nilgiri Hills.

(See Fraser Journ., Bombay, Nat. Hist. Soc., January, 1915, pp. 354-355.)

15.—* **CRATILLA LINEATA** (Brauer).

1 ♂, 1 ♀, Kandy, May 10, 1911.

I cannot separate these specimens from examples from Borneo by any features of specific or even of sub-specific value.

They are presumably identical with Forster's species *Cratilla culverti* from Malabar; and, if so, that species cannot stand.

Cratilla appears to be an example of a genus occurring in S. India, Ceylon, Burma, and the Malayan countries, but absent from the Himalayas.

16.—† *LATHRECISTA ASIATICA* (Fabr.).

Lathrecista simulans Kirby, "Dragonflies of Ceylon," p. 553.

The species ranges over the whole Oriental region and as far as the Tonga Islands in the Pacific.

17.—*POTAMARCHA OBSCURA* (Ramb.).

2 ♂♂ Chilaw, January, 1910. 1 ♂ Galagedara, January, 1910.

1 ♂ Puttalam, January, 1910.

2 ♀♀ Chilaw, January, 1910. 1 ♀ Batticaloa, August, 1910.

The single species of the genus ranges over nearly the whole Oriental region. The specimens before me have well-marked yellow tinting along the costal margin of the wings much more pronounced than in examples from Lower Siam.

18.—*ORTHETRUM PRUINOSUM NEGLECTUM* (Ramb.).

Orthetrum pruinsum Kirby, "Dragonflies of Ceylon," p. 554.

3 ♂♂ Kandy, May, 7, 1911. 1 ♂ Kandy, July, 1910.

2 ♀♀ Kandy, May 12, 1911.

The species ranges to Java and Borneo, the sub-species is Indian.

19.—*ORTHETRUM LUZONICUM* (Brauer).

Orthetrum tricolor Kirby, "Dragonflies of Ceylon," p. 555-556.

2 ♂♂ Maskeliya, 4-5,000 ft., May 4, 1901 "abdomen and eyes pale blue." (Very mature and pruinose.)

3 ♂♂ Pundaluoya, November, 1909. 1 ♂ Kandy, November, 1909.

Ranges through India and Burma to Sumatra and Java.

20.—*ORTHETRUM SABINA* (Drury).

1 ♂ Peradeniya, May, 1902. 1 ♂ Trincomalee, August, 1909.

1 ♂ Kandy, November, 1909.

2 ♂♂ Chilaw, January, 1910.

1 ♀ Trincomalee, November 2, 1901. 1 ♀ Trincomalee, September, 1909, 2 ♀♀ Peradeniya, November 10, 1909, 1 ♀ Chilaw, January, 1910, 1 ♀ Kandy, May 11, 1911.

Ranges over the whole Orient to the Pacific and Australia. One of the commonest dragonflies in collections from all parts of the East.

21.—*ORTHETRUM GLAUCUM* (Brauer). (Text Fig. 3.)

4 ♂♂ Pundaluoya, November, 1909. 1 ♂ Kandy, May, 1911.
1 ♀ Maskeliya, 4,500 ft., April, 1901. 3 ♀♀ Pundaluoya,
November, 1909.

Ranges from India and Ceylon to Hong Kong and the Celebes.



FIG. 3.—Lateral view of genital structures of the second abdominal segment of *Orthetrum glaucum* ♂

22.—† *ORTHETRUM TRIANGULARE* (Selys.).

Orthetrum carnaticum Kirby, "Dragonflies of Ceylon," p. 555.

Ranges through India and Burma to Malacca. Major Fraser tells me (*in litt.*) that he thinks there is some possibility that the species *triangulare* may really include two distinct forms which have been confused.

23.—† *BRACHYDIPLAX SOBRINA* (Ramb.).

Occurs in Ceylon, India, and Burma. It is the only representative so far as I know in Ceylon of the group to which it belongs—a group which is very characteristic of the Great Sunda Islands, especially of Borneo and the Malay Peninsula.

24.—*DIPLOCODES TRIVIALIS* (Ramb.).

Trithemis trivialis Kirby, "Dragonflies of Ceylon," p. 550.

1 ♂ Trincomalee, December 9, 1900. 1 ♂ Peradeniya,
May, 1902. 1 ♂ Sigiriya, September 5, 1909.

1 ♂ Kandy, November 26, 1909. 1 ♂ Batticaloa, August,
1911. 1 ♂ Jaffna, September, 1911.

2 ♀♀ Sigiriya, September 6, 1909. 1 ♀ Galagedera, January,
10. 1 ♀ Chilaw, January, 1910. 1 ♀ Batticaloa, August,
1911.

Ranges from the Seychelles through the Orient to New Guinea. Often taken at sea.

25.—*DIPLACODES NEBULOSA* (Fabr.).

1 ♂ Kandy, July, 1909. 1 ♂ Ambalangoda, February 28, 1911. 1 ♀ Ambalangoda, February 28, 1911.

Ranges from India and Ceylon to North Queensland.

26.—*ACISOMA PANORPOIDES* (Ramb.).

1 ♀ Maskeliya, April 4, 1901. 4,500 feet.

A small individual, length of abdomen 15 mm., of hinder-wing 18 mm. The sub-species ranges over India, Burma, Indo-China, and Siam, reaching Singapore and Sumatra. It has been recorded also from the Celebes, but not from Borneo. An allied species or sub-species is found in Africa.

27.—* *INDOTHEMIS CAESIA* (Ramb.).

5 ♂♂ Jaffna, June, 1910. 1 ♂ Trincomalee, April 28, 1911.

This species seems to be characteristic of Peninsular India and Ceylon, where it seems tolerably abundant.

28.—*† *INDOTHEMIS LIMBATA* (Selys.), race ?

A small series of a form of this species is in the British Museum. Mr. Champion regards them as sufficiently distinct from the typical race found in the Malay Peninsula to deserve recognition as a sub-species, an opinion with which I am in agreement.

Limbata has not been recorded from the mainland of India, and is hitherto known only from lower Burma, Siam, and the Malay Peninsula.

29.—*CROCOTHEMIS SERVILIA* (Drury).

Crocotthemis soror Kirby, "Dragonflies of Ceylon," p. 551.

1 ♂ Kandy, July, 1909. 4 ♂♂ Chilaw, January, 1910.

4 ♀♀ Trincomalee, September, 1909. 1 ♀ Chilaw, January, 1910. 1 ♀ Jaffna, September, 1911.

♂ Length of abdomen 24 mm., of hinder-wing 27·5 mm.

♀ Length of abdomen 22 mm., of hinder-wing 27·5 mm.

30.—BRADINOPYGA GEMINATA (Ramb.).

Bradinopyga stigmata Kirby, "Dragonflies of Ceylon,"
pp. 553-554., Pl. XLI., fig. 3.

2 ♂♂ Jaffna, June, 1910. 4 ♀♀ Jaffna, June, 1910.

7 ♀♀ Batticaloa, September, 1911.

The males are both fully mature, the females from Jaffna are all of them teneral, those from Batticaloa are mature. The species appears especially characteristic of Peninsular India and Ceylon, other species of the genus are African.

31.—BRACHYTHEMIS CONTAMINATA (Fabr.).

1 ♂ Kandy, July, 13, 1910.

This species ranges over the whole of British India, Burma, Siam, and the Malay Peninsula to Sumatra and Java. It has not been recorded from Borneo.

32.—NEUROTHEMIS TULLIA (Drury).

1 ♂ Trincomalee, September, 1909. 4 ♂♂ Kandy, May, 1907, November, 1909

10 ♂♂ Chilaw, January, 1910. ♂ Ambalangoda, February 28, 1911.

4 ♀♀ Chilaw, January, 1910. 4 ♀♀ Kandy, January, May, 1911.

1 ♀ Ambalangoda, February 28, 1911.

Common throughout India, Burma, and Indo-China; occurring also in Sumatra and Java. Individuals from Burma are some of them identical with the Indian and Ceylonese form, others seem to resemble rather the form described as *feralis* (Burma), but whether this form is a geographical race or an aberration is unsettled.

33.—NEUROTHEMIS INTERMEDIA INTERMEDIA (Ramb.).

4 ♂♂ 1 ♀ Kandy, July, 1909, November, 1909, January, 1910.

Similar to examples from Poona received from Major Fraser.

34.—† RHODOTHEMIS RUFA (Ramb.).

Erythemis rufa Kirby, "Dragonflies of Ceylon," p. 556,

Orthetrum oblitum id *ibid.*, p. 554.

Pl. XLII., Fig. 3.

Ranges from Ceylon and India to New Guinea and North Australia. Apparently, however, not as a rule, on abundant species.

35.—* SYMPETRUM FONSCOLOMBEI (Selys.).

1 ♂ Hakgala, Ceylon, August, 1911.

I have been able to compare this specimen with examples from the Nilgiri Hills, kindly sent me by Major F. C. Fraser, I.M.S. The extension of the range of this species to Ceylon is not perhaps surprising, but decidedly of interest.

Has been taken in Surrey, inhabits Central and South Europe, is recorded from Cape Town and elsewhere in Africa, from Asia Minor and Syria.

36.—† TRITHEMIS KIRBYI (Selys.).

Closely related to the African *T. ardens*. Ris regards the two as geographical races. I have seen examples from Poona, received from Major Fraser.

37.—TRITHEMIS AURORA (Burm.).

2 ♂♂ Kandy, July, 1909. 3 ♂♂ Haragama, July 15, 1910. 2 ♂♂ Haragama, May, 1911. 1 ♀ Trincomalee, December 9, 1900. 1 ♀ Kandy, June 25, 1910. 1 ♀ Haragama, July 15, 1910. 1 ♀ Haragama, May, 1911.

♂ H. W. 26 mm., abd. 24 mm.; ♀ H. W. 25 mm., abd. 21 mm.

Similar in size to examples from S. India.

The species ranges over the Oriental region as far as Borneo.

38.—TRITHEMIS FESTIVA (Ramb.).

1 ♂ Trincomalee, November 1909, 2 ♂♂ (immature), Pundaluoya, November, 1909.

1 ♂ Kandy, July, 1909. 1 ♂ Galagedara, January, 1910.

1 ♂ Chilaw, January, 1910.

1 ♂ Haragama, May, 1911.

1 ♀ Pundaluoya, November, 1909 (immature).

This species is found through the Oriental region and as far as the Moluccas.

39.—* *TRITHEMIS PALLIDINERVIS* (Kirby).

1 ♂, 1 ♀ Chilaw, January, 1910. 1 ♂ Hakgala, August, 1911.

This species does not figure in Kirby's list, but has been noted as occurring in Ceylon by Ris in his Monograph. Range from Burma through Peninsular India.

40.—* *ZYGONYX IRIS* (Selys.).

Zygonydia ceylanica Kirby. Ann. Mag. Nat.

Hist. (7) V., p. 533.

1 ♂ Haragama, July 15, 1910. 1 ♀ Haragama. July 15, 1910. 1 ♀ Kandy, January, 1908.

The male has less yellow on the sides of the thorax and on the second segment of the abdomen than has a specimen in my possession from the Nilgiri Hills, for which I am indebted to Major Fraser; whilst the seventh segment of the abdomen is entirely black.

♂ Length of abdomen 35 + 2 mm., of hinder-wing 50 mm.

♀ Length of abdomen 45 mm., of hinder-wing 55 mm.

The species is recorded from the Nilgiri Hills, Bengal, Burma, Tonkin, Hainan, the Malay Peninsula, and Borneo.

41.—*† *ONYCHOTHEMIS TESTACEA CEYLANICA* Ris.

I have not seen an example from Ceylon. I have, however, been able to examine a number of specimens from Tonkin and the Malay Peninsula. Major Fraser tells me (*in litt.*) that he has recently captured an *Onychothemis* in the Nilgiri Hills. This is probably closely allied to the Ceylon race.

42.—*THOLYMIS TILLARGA* (Fabr.).

1 ♂ Kandy, December 9, 1909.

The species is well-nigh cosmopolitan.

43.—*PANTALA FLAVESCENS* (Fabr.).

4 ♂♂, 1 ♀ Jaffna, September, 1911. 1 ♂, 1 ♀ Trincomalee, September, 1909.

Range, cosmopolitan.

44.—*TRAMEA BASILARIS BURMEISTERI* Kirby.

Tramea burmeisteri Kirby, "Dragonflies of Ceylon," p. 548.

1 ♂ Chilaw, January, 1910.

The species ranges from Tropic Africa through India to Tonkin, the sub-species is the Asiatic form.

45.—*TRAMEA LIMBATA* (Desjardins).

Tramea stylata Kirby, "Dragonflies of Ceylon," p. 548.

1 ♂ Peradeniya, November, 1902. 1 ♂ Trincomalee, September 8, 1909.

1 ♂ Puttalam, January, 1910. 1 ♂ Jaffna, September, 1911.

This species ranges over pretty well the whole of the old world Tropics reaching even Samoa and the Fiji Islands.

46.—*HYDROBASILEUS CROCEUS* (Brauer).

Hydrobasileus extraneus Kirby, "Dragonflies of Ceylon,"
p. 547, Pl. XLI., Fig. 1.

1 ♀ Kandy, May, 1909.

Recorded from Burma, Tonkin, Cambodia, the Malay Peninsula, and islands, as far as the Celebes and the Moluccas.

47.—† *ZYXOMMA PETIOLATUM* (Ramb.).

Ranges as far as the Malay Peninsula and Sumatra, but is not apparently an abundant species.

48.—*RHYOTHEMIS VARIEGATA* (Linn.).

8 ♂♂ Chilaw, January, 1910. 14 ♀♀ Chilaw, January, 1910.

This species is found throughout India and ranges across Burma into China. In the Malay Peninsula and generally in the south-east it is replaced by *R. phyllis* Sulzer.

49.—*RHYOTHEMIS TRIANGULARIS* (Kirby).

Rhyothemis lankana Kirby, "Dragonflies of Ceylon," p. 459.

2 ♂♂ Kandy, May, 1910. 3 ♀♀ Kandy, May, June, 1910.

I have compared these specimens with examples from Borneo and the Malay Peninsula, and cannot find any distinguishing features.

50.—*UROTHEMIS SIGNATA SIGNATA* (Ramb.).

Urothemis sanguinea. Kirby, "Dragonflies of Ceylon,"
p. 552.

1 ♂, 2 ♀♀ Jaffna, June, 1910. , September, 1911.

This species ranges over the whole of the Oriental region, and as far as New Guinea. The sub-species is apparently confined to the continental area of the region.

51.—† *MACRODIPLAX CORA* (Brauer).

Urothemis vittata Kirby, "Dragonflies of Ceylon," p. 552,
Pl. XLII., Fig. 2.

The British Museum possesses several examples of this species from Ceylon. It ranges from Madagascar to Queensland. Perhaps breeds in brackish water.

SUB-ORDER : ZYGOPTERA.

Sub-family : **L'bellaginae.**

52.—*MICROMERUS FINALIS* (Selys.). (Text Fig. 4.)

Micromerus finalis Kirby. Cat. Odonata. p. 115.

1 ♂ Kandy, November 26, 1909.

Length of abdomen 16 mm., of hind-wing 21 mm.

The single fully adult male agrees closely with the type male in the British Museum, with which I have compared it.

Head, upper lip black, anteclypeus metallic blue, post-clypeus black, frons with two pairs of pale yellow spots, genae with small yellow markings. Occiput with a small post-ocular spot on either side, also yellow.

Prothorax black, posterior margin yellow in the centre, and a yellow spot on either side.

Synthorax black, mid-dorsal caina finely marked with yellow; on either side of this is a yellow dorsal line, narrow, but widening anteriorly, not reaching the alar series.

There is a trace of a yellow line at the upper end of the humeral suture. Side yellow margined with black, and with a black band along the second lateral suture. This band gives off an angular projection in its upper half, which encroaches on the yellow of the metepisternite. Ventral surface black.

Legs: all three pairs of femora with yellow on the anterior surface of the upper half. Below this pruinose; tibiae also pruinose anteriorly.



FIG. 4.—Diagrammatic representation of colour-pattern of first four segments of abdomen of *Micromerus finalis* ♂.

Abdomen black, first segment with yellow apical band transversely on the dorsal side. Segments 2-7 with paired dorsal spots.

These are small on the second segment. Then increasing on 3·4, becoming smaller again on 5·6 and almost obsolete on 7.

In addition 2-5 have a series of lateral ventral spots on either side; these coalesce in each case with the anterior end of the corresponding dorsal spot.

Wings tinged with saffron towards the base. The fore-wing is without a pterostigma, and has a dark spot at its apex covering about 3 mm. of the length of the wing. Seven antenodal cross-nerves.

53.—* *MICROMERUS GREENI* n. sp. (Text Fig. 5.)

1 ♂ Haragama, August, 1903. 2 ♂♂ Haragama, June 5, 1910.

1 ♂ Peradeniya, June 5, 1910. 1 ♂ Peradeniya, July 10, 1910 (this specimen is the type).

1 ♂ Kandy, November 26, 1909. 1 ♂ Kandy, December 9, 1909.

Type ♂ deposited in the British Museum.

This little species is a member of the same group as *M. lineatus* but resembles rather *M. aurantiacus* Selys., of Borneo, in colouring.

It is, however, quite distinct and appears to be undescribed. Length of hind-wing 18 mm., of abdomen 14 mm.

Head black, apex of clypeus metallic blue ; a small yellow spot on either side internal to the base of the antennæ, and a small yellow spot on either side of the posterior ocelli ; a few transverse lines of the same colour across the occiput and minute postocular spot, interior yellow, *prothorax* black with yellow marks on the sides, and a median posterior spot of the same colour.

Dorsum of *synthorax* black, the mid-dorsal carina narrowly marked out in yellow, a dorsal line of yellow on either side of it immediately to the median side of the humeral suture ; this line narrows posteriorly and does not reach the wing base. The upper part of the humeral suture shows a trace of a yellow line.

Side of *synthorax* yellow margined behind and below with black, and with a band of black along the second lateral suture. The upper half of this band expands anteriorly so as to encroach largely on the yellow of the upper part of the metepimerite.



FIG. 5. —Colour pattern of abdomen of *Micromesrus greeni* ♂.

The ventral surface of the *synthorax* is black

The *legs* are black, the upper half of the first two pairs of femora are marked with yellow anteriorly, the anterior surface of the third pair and of the tibiæ pruinose.

The *abdomen* is black, the first segment has an apical transverse band of yellow on the dorsum. The colour pattern of the segments 2-8 consists of paired dorsal and lateral ventral spots, the spots on segments 2 3 are orange coloured, those on the other segments brick-red.

The dorsal spots on segment two are small, and coalesce externally with the larger lateral ventral spot. The dorsal spots on 3·4·5 are progressively larger, whilst the lateral spots, coalescing with them anteriorly are progressively smaller.

On 6·7·8 the dorsal spots cover nearly the whole of the dorsum of each segment, the lateral ventral spots are of about the same size as in segment 5, but not well defined. Lastly, segments 9·10 have small, not very well defined, dorsal spots.

The wings are tinged with yellow, especially the hinder pair and towards the base. The anterior pair, which are without a pterostigma have the apex marked for a length of about 3 mm. with a black spot which has a metallic lustre. There are six antenodal nerves in the fore-wing.

A young male from Haragama, with quite immature colouring, has the dorsum of the ninth segment very largely marked with yellow, whilst the whole of the dorsum of the tenth segment is likewise yellow.

54.—*MICROMERUS LINEATUS* (Burm.).

Micromerus lineatus Kirby, Cat. Odonata, p. 115.

1 ♂ Haragama, July 18, 1910.

Length of hind-wing 18 mm., antenodal 5·6

This specimen, which I have compared with a series in Mr. E. B. Williamson's collection from Candervalay, lacks the yellow tinge of the base of the wing characteristic of the males of other species from Ceylon. The brilliant canary yellow of the abdomen (segments 2·5) renders this little species very conspicuous.



FIG. 6.—Diagrammatic representation of colour-pattern of first four segments of abdomen of *Micromerus lineatus* ♂ from Ceylon.

The species stands badly in need of careful examination. Specimens from Poona and Ceylon differ strikingly from examples from Burma and Siam, &c. Perhaps the Indian specimens ought to be called *M. obscurus* Kirby, or they may more probably be found to belong to a recognizable geographical

race of this widely ranging species. Specimens in the British Museum from Ceylon have been labelled by Martin as *M. lineatus ceylanicus*, but the name is, of course, so far only a manuscript one.

Micromeris sp. ♀♀.

I cannot satisfy myself as to the species, one or more, to which these specimens should be referred. They are mostly much faded in colouring, or else immature. Probably all of them are *M. lineatus* and (or) *M. greeni*. It is quite likely that the females of these two species are even when alive very similar in appearance, and I do not find it possible to come to any satisfactory opinion on the examples before me.

Sub-family : **Calopteryginae.**

55.—*NEUROBASIS CHINENSIS* (Linn).

N. chinensis Kirby, Cat. Odonata, p. 102.

3 ♂♂ Haragama, August, 1903, 1 ♂ Haragama, September, 1909. 2 ♂♂ Haragama, July 17, 1910.

6 ♂♂ Kandy, November 26, 1909. 1 ♂ Kandy, July, 1910. 1 ♂ Kandy, May, 1909.

3 ♂♂ Galagedara, January, 1910. 1 ♂ Gonagama, October, 1909. 1 ♂ Peradeniya, July 10, 1910.

3 ♀♀ Haragama, August, 1903. 5 ♀♀ Haragama, November and December, 1909. 3 ♀♀ Galagedara, January, 1910.

2 ♀♀ Kurunegala, January, 1910. 2 ♀♀ Haragama, May, 1911. 1 ♀ Kandy, November 26, 1909.

1 ♀ Peradeniya, July, 1910.

Found all over the Oriental region, haunts especially fairly wide rapidly flowing rivers.

56.—*VESTALIS APICALIS* (Nels.).

Vestalis apicalis Kirby, "Dragonflies of Ceylon," p. 558.

5 ♂♂ Kandy, July, November, 1909. 1 ♂ Ratnapura, October, 1909. 1 ♂ Kandy, July 8, 1910.

1 ♂ Haragama, July 18, 1910.

2 ♀♀ Kandy, October-November, 1909. 1 ♀ Peradeniya, December 29. 1910.

The females are entirely without the dark apical mark on the wing. Females from the Nilgiri Hills have this dark marking at any rate in a certain number of specimens.

I think *apicalis* must be regarded as a local race of *gracilis* Selys, a species with an extensive range on the mainland of tropical Asia which, however, does not reach so far south as the Malay Peninsula, where it is replaced by the distinct, though closely allied, *V. amoena* Selys.

The British Museum possesses a pair of *vestalis* from Tonkin evidently closely similar to *apicalis*, which name has in fact been given them by Major Fraser. I should be inclined to regard them as another local race of *gracilis*, not necessarily identical with the South Indian and Ceylon form *apicalis*; but I have not had an opportunity of studying them with sufficient care.

Sub-family : **Epallaginae.**

57.—PSEUDOPHAEA SPLENDENS (Selys.).

Pseudophaea splendens Kirby, "Dragonflies of Ceylon," p. 559.
P. carissima Kirby, loc. cit p. 559, Pl. XLII., Fig. 4.

4 ♂♂, 4 ♀♀ Hatton, May 27, 1911. ♂ h. w. 35 mm., abd. 42 mm. ♀ h. w. 37 mm., abd. 37 mm.

4 ♂♂, 2 ♀♀ Pundaluoya November, 1909. ♂ h. w. 32 mm., abd. 40 mm. ♀ h.w. 32.5 mm., abd. 33 mm.

1 ♂, January, 1908. 1 ♂, May, 1909. 2 ♂♂, August, 1909, 2 ♀♀. December, 1910, Kandy. ♂ (largest) h. w. 30. (smallest) h. w. 27. ♀ h. w. 31 mm., abd. 31 mm.

8 ♂♂, 1 ♀, 15-17, July, 1910. 2 ♂♂, April 21, 1911 Haragama. ♂ h. w. 27.29 mm., abd. 37 mm.

1 ♂ Kurunegala, January, 1910. 1 ♂ Goragama, October, 1909. Similar in size to Haragama specimens.

8 ♂♂ Galagedara, January, 1910. h. w. 28 mm., abd. 38 mm.

I have examined the type-specimen of *P. carissima*, Kirby, in the British Museum and can find no structural differences between it and *splendens*, and in view of the considerable

differences in size existing in the series before me, I am strongly inclined to regard *carissima* as merely a small phase of *splendens*. I think it possible that Kirby may have been misled by examining specimens with closed wings, as the under surface of the hind-wing is lacking in the brilliant green reflex seen on the dorsal surface of the same wing, to which perhaps is to be ascribed his var. *viridis*.

Splendens does not seem to be at all closely related to *dispar* Selys. and *fraseri* Laidlaw from the Nilgiri Hills. Its affinities are rather with Malayan species, such as *variegata* Selys.

Sub-family : **Lestinae.**

58.—**LESTES ELATA** Selys.

Lestes elata Laidlaw, Rec. Indian. Mus., XIX., 4., p. 153,
Text Fig. 2., Pl. V., Fig. 5.

3 ♂♂ Puttalam, January, 1910. 1 ♂ Pundaluoya, November 15, 1909.

2 ♀♀ Kandy, September, 1907. November 26, 1909.

A typical Indian species ranging from Ceylon, through India to Assam and Burma.

59.—† **LESTES DECIPIENS** Kirby ?

Lestes decipiens Kirby, "Dragonflies of Ceylon"
pp. 565-566.

I cannot separate the type of this species from *L. prae-morsa* Selys., a species common in India and Indo-China as far as the Malay Peninsula. However, *prae-morsa* appears to show some constant local variations, so Kirby's name should remain, pending more detailed study.

60.—† **LESTES ORIENTALIS** Selys.

Lestes orientalis Kirby, Cat. Odonat., p. 163.

Recorded from Ceylon only. Its size suggests that this is possibly allied to *Orolestes*.

61.—*LESTES GRACILIS GRACILIS* (Selys.). (Text Figs. 7a, 7b.)

Lestes gracilis gracilis Ris, Supplementa. Entomol., No. 5, pp. 14-15.

9 ♂♂ Hakgala, August, 1911. 1 ♂ Maskeliya, 4,500 ft., April 4, 1901.

1 ♂ Hewaheta, March 6, 1910. 3 ♀♀ Hakgala, August, 1911. 1 ♀ Hakgala, August 29, 1909.

The sub-species is recorded from Ceylon only, the race *birmanicus* from S. India and Burma; and the race or sub-species *peregrinus* Ris, from Japan.

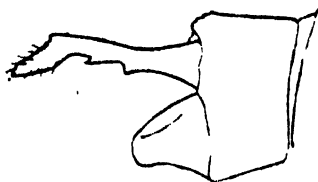


FIG. 7A.—Anal appendages of *Lestes gracilis gracilis* ♂ lateral view.



FIG. 7B.—Colour pattern of dorsum of second abdominal segment of *Lestes gracilis gracilis* ♂.

62.—*LESTES DIVISA* (Selys.). (Text Figs. 8a, 8b.)

Lestes divisa Kirby, Cat. Odonata, p. 163.

4 ♂♂ Kandy, May, 1909; 1 ♂ Kandy, May, 1910; 1 ♂ Kandy, July 3, 1910.

1 ♀ Kandy, May, 1909.

Recorded from Ceylon only.

The species is exceedingly like *L. gracilis*, and with it, belongs to the section of the genus *Lestes* which is characterized

especially by the extremely acute outer angle of the quadrilateral. Other species similarly characterized, and presumably all to be included in the same section are the Himalayan *L. cyanea* Selys., and Australian species of the genus, as well as the European *Lestes* (*Sympecma*) *fusca*. I do not at present propose to adopt either of the generic names suggested for members of this section, viz., *Austrolestes* Tillyard, *Ceylonolestes* Kennedy.



FIG. 8A.—Anal appendages of *Lestes divisa* ♂, lateral view.



FIG. 8B.—Colour pattern of dorsum of second abdominal segment of *Lestes divisa* ♂.

As noted in the Selysian Synopsis *L. divisa* differs from *L. gracilis* as follows :—

L. divisa—

- (i.) Upper surface of head bronze.
- (ii.) Dorsum of synthorax greenish bronze; this colour narrows anteriorly.
- (iii.) Dark dorsal mark of first segment of abdomen metallic-green, touching both ends of the segment.
- (iv.) The dark basal mark of the ninth segment of the abdomen of the male ends in a *backwardly directed point*, instead of being forked, in the female the whole segment is dark.

- (v.) Upper anal appendages of the male yellow at their middle; the internal dilatation begins gradually, not suddenly, with a spur which is longer than in *gracilis*. Apex of these appendages shorter, rounded, not lancet-shaped; without a tubercle below.
- (vi.) The pterostigma is slightly shorter

Of these characters (i.) and (ii.) are perhaps not of much importance, and may depend on the maturity of the specimens. The remaining points are quite constant. I find that the pattern of the second abdominal segment is the readiest guide to identification (see Text Fig. 8b).

As to the female the single *divisa* ♀ from Kandy is very immature, so that I cannot speak with certainty save that the character of the pterostigma holds good.

Sub-family : **Platystictinae.**

A.—Rather large species. (Hind-wing 30 mm. or more.) Sectors M_5 and M_4 much angled, so that many of the cells are markedly pentagonal. M_{1+3} and M_4 leave the arculus separately. M_3 leaves the common trunk considerably before the level of the cross-vein descending from the nodus.

PLATYSTICTA.

B.—Rather smaller species (Hind-wing 25.28 mm.) sectors M_5 and M_4 , not angled, so that most of the cells about them are quadrangular. M_{1+4} and M_4 leave the arculus by a common stalk. M_3 leaves the common trunk immediately before the level of the cross-vein descending from the nodus.

DREPANOSTICTA.

The genus *Platysticta* is confined to Ceylon and South India, and is one of the most interesting of the fauna. Its nearest ally is the South American *Palaemnema*.

Ceylon has two species of *Platysticta*, South India (Cochin State) has one. These insects are probably very primitive and a knowledge of the larval form is much to be desired.

The two Ceylonese species are readily distinguishable by the fact that *P. apicalis* has the apices of the wings from the

level of the pterostigma tinged with brownish-black, whilst the wings of *P. maculata* are colourless. Both species have the thorax black; whilst in *P. deccanensis* from South India this structure is of a cinnamon-brown colour.

63.—*PLATYSTICTA APICALIS* Kirby.

Platysticta apicalis Kirby, "Dragonflies of Ceylon,"
p. 561, Pl. XLII., Fig. 1.

64.—† *PLATYSTICTA MACULATA* Selys.

Platysticta maculata Kirby, "Dragonflies of Ceylon,"
p. 561. *greeni* Kirby, Proc. Zool. Soc. Lond., 1891,
p. 204., Pl. XX., Fig. 3.

P. maculata Kirby, Cat. Odonata, p. 132.

65.—*DREPANOSTICTA DIGNA* (Selys.). (Text Fig. 9.)

Platysticta digna Kirby, "Dragonflies of Ceylon," p. 562.

1 ♂ Haragama, May, 1911. 1 ♀ Haragama, August, 1903.
(allotype.)

♂ Differs from the description of the type in having the distal third of the eighth segment of the abdomen coloured blue dorsally, whereas the type is said to have this segment entirely black. The sides of the synthorax, along the first lateral suture is blue.

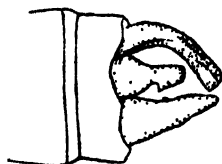


FIG. 9.—Anal appendage of *Drepanosticta digna* ♂ seen from the side obliquely.

♀ Colouring as in the male. Eighth segment of abdomen shorter than the ninth, its apex narrowly marked with blue

dorsally. Segments 9-10 likewise blue above. The tenth segment is truncate posteriorly.

♂ Length of abdomen 34 mm., of hind-wing 21.5 mm.

♀ Length of abdomen 31.5 mm., of hind-wing 23 mm.

66.—† DREPANOSTICTA TROPICA (Selys.).

Platysticta tropica Kirby, "Dragonflies of Ceylon," p. 562.

67.—† DREPANOSTICTA MONTANA (Selys.).

Platysticta montana Kirby, "Dragonflies of Ceylon," p. 562.

68.—† DREPANOSTICTA HILARIS (Selys.).

Platysticta hilaris Kirby, "Dragonflies of Ceylon," p. 562.

DREPANOSTICTA sp.

Drepanosticta sp. (Text Figs. 10, 11.)

4 ♂♂, 4 ♀♀ Kandy, June-July. 1907, 1909, 1910.

These specimens do not agree exactly with any of the Selysian species.

♂ *Head* dull black, except the upper lip which is pale blue, the margin black.

Prothorax bronze-black above, paler at the side and below, posterior margin with obtuse lateral angles.

Thorax bronze-green on the dorsum, the sides bronze-brown, fading ventrally to pale yellow. Immediately behind the first lateral suture a line of dull blue can be distinguished in the best preserved specimens, the metepimeron also appears bluish-yellow.

Legs dull yellow, darker at the articulations.

Abdomen dark-brown with suggestion of bronze, ventral surface a little lighter in tint. Segments 3-7 have each a pair of basal dorsal spots of a pale yellow colour. Dorsum of segments 9-10 (and in one case a small terminal mark on 8) blue. Anal appendages brown, upper pair stout, sharply

angled downward at their middles, the distal half carrying a ventral blade like edge. Lower pair shorter, very stout at base, narrowing rapidly to become very slender and thread-like, directed straight backwards. A stray short tooth projects backward from the upper part of the base of each.

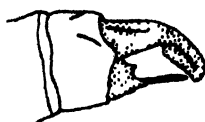


FIG. 10.—Anal appendages of *Drepanosticta* sp. ♂ (Kandy) seen from the side.

♀ Rather larger and more stoutly built than is the male. Colouring generally similar, but segments 8·9·10 of abdomen are dark-brown, one specimen shows indication of a light (probably blue) mark on the base of the ninth segment dorsally. Apex of 10 truncate.

Wings: Pterostigma slightly longer than it is broad, dark-brown in colour with narrow pale margin.

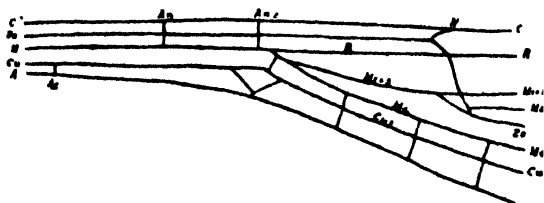


FIG. 11.—Base of R fore-wing of *Drepanosticta* sp. ♀ (Kandy) diagrammatic.

A. = Anal vein, Ac. = anal crossing, Zs Zygopterous sector (= radial sector of Comstock and Needham). In this Zs rises from vein descending from Nodus, N.

M_{1+3} and M_4 with a very short common stalk at arculus. M_3 generally rises a little before the level of the cross-vein descending from the nodus, and Zs immediately after, but in the case of one female Zs rises on all four wings from the cross-vein. Post-nodals 15·17.

♂ Length of abdomen 37·5 mm., of hind-wing 22·5 mm.

♀ Length of abdomen 36 mm., of hind-wing 26 mm.

This species is perhaps identical with *P. hilaris* Hagen, but without confronting specimens I cannot be sure.

DREPANOSTICTA sp.

1 ♂ 1 ♀ Pundaluoya, April, 1898.

Too damaged to identify. The pterostigma is about twice as long as broad.

Sub-family : **Platyneminae.**

Series : Platynemis.

69.—*COPERA MARGINIPES* (Ramb.).

Copera marginipes Kirby, "Dragonflies of Ceylon," p. 560.

2 ♂♂ July–September, 1907. 2 ♂♂ November, 1909. 2 ♂♂ June, 1910. 2 ♂♂ July, 1910. 1 ♂ January 3, 1911—all from Kandy. 1 ♂ Avissawella, October 5, 1909.

2 ♀♀ Peradeniya, July 6, 1907.

2 ♀♀ May, 1907. 3 ♀♀ July, 1907. 3 ♀♀ September, 1907. 1 ♀ May, 1910—all from Kandy. 1 ♀ December, 1900. Trincomalee.

I have also examined a long series of specimens in Mr. E. B. Williamson's collection. Apparently the only form of the genus found in Ceylon.

The specimen labelled *serapica* in the British Museum is unidentifiable. *Marginipes* ranges throughout tropical continental Asia to Java and Sumatra. I have never seen specimens from Borneo.

Series : Disparoneura.

70.—DISPARONEURA TENAX (Selys.). (Text Fig. 12.)

Disparoneura tenax Kirby, "Dragonflies of Ceylon," p. 562, Pl. XLI., Fig. 2.

1 ♂ Diyatalawa, July 14, 1901. 4,200 feet.

"Eyes ruby, mouth parts the same, scarlet line between eyes at vertex.

Thorax velvety-black with three scarlet lines on either side. Body black, junction of segments dark, steel blue."

Abd. 36 mm. H. W. 27 mm.



FIG. 12.—Anal appendages of *Disparoneura tenax* ♂ seen from the side.

Perhaps the largest of the *Disparoneuras*, almost equal in size to *Indoneura gomphoides* Selys. It is a true *Disparoneura* with the specialized prothorax in the female.

71.—DISPARONEURA CAESIA (Text Fig. 13).

Disparoneura caesia Kirby, "Dragonflies of Ceylon," p. 562.

3 ♂♂ Kandy, July and December.

1 ♂ 1 ♀ Peradeniya, May.

I have compared these specimens with examples in the British Museum.

The males are entirely black, with violet reflex, most noticeable on the sides of the synthorax. None show much pulverulescence, though all appear fully mature. H. W. 20 mm., abd. 30 mm.



FIG. 13.—Anal appendages of *Disparoneura cucsia* ♂ seen from the side.

The female (allotype) is black in colour, without violet reflex and with yellow markings as follows : Genæ, ante- and post-clypeus ; a narrow line on either side of the prothorax, interrupted posteriorly ; two oblique bands on either side of the synthorax. There are also yellow marks laterally on segments 1·2·3 and 8·9 of the abdomen, which is brown ventrally from 2-7. The coxæ and anterior surface of the femora are marked with yellow.

The posterior margin of the prothorax bears a pair of short processes directed upwards and backwards. H. W. 20 mm., abd. 25 mm.

This species differs from its allies in having no markings on the vertex or occiput in either sex.

72.—† *DISPARONEURA CENTRALIS* (Selys.).

Disparoneura centralis Kirby, "Dragonflies of Ceylon,"
p. 502.

73.—† *DISPARONEURA OCLATA* Kirby.

Disparoneura oculata Kirby, "Dragonflies of Ceylon,"
pp. 502-503.

74.—*CACONEURA SITA* (Kirby). (Text Figs. 14a, 14b).*Disparoneura sita* Kirby, "Dragonflies of Ceylon," p. 563.

3 ♂♂ Trincomalee, December 9, 1900. 1 ♂ Kandy, July 11, 1910.

Length of abdomen 28 mm., of hind-wing 17.5 mm.

FIG. 14A.—Anal appendages of *Caconeura sita* ♂ seen from the side and a little obliquely.FIG. 14B.—Part of wing-base of fore-wing of *C. sita* ♂ diagrammatic, ac — anal crossing or anal cross-vein, ab — anal bridge, which is *incomplete*, i.e., does not reach Cu₂, the vein descending from the distal end of the quadrangle.

I group in the genus *Caconeura* those species of the series *Disparoneura* in which the vein known as the anal bridge (Ab.) is incomplete as in the Ceylon species and in some species from Malaya, or where it is altogether missing as in many Malayan species. I retain in *Disparoneura* those species in which this vein is complete, i.e., reaches the cross-vein descending from the distal end of the quadrangle. Papuan species showing a similarity to *Caconeura* in this respect are generally separable by the different relative position of the end cross-vein (Ac.).

75.—* † *CACONEURA MACKWOODI* (Fraser).

Caconeura mackwoodi Fraser, Journ., Bombay, Nat.
Hist. Soc., XXVI., p. 875.

Distinguished from *C. sita* by its slightly larger size (hind wing 21 mm.) and by the absence of white markings on the dorsum of the synthorax.

Sub-family : **Agrioninae.**

76.—*ACIAGRION HISOPA* Selys.

Pseudagrion ? *hisopa* Kirby, Cat. Odonata, p. 153.

Aciagrion hisopa Selys., Ann. Mus. Civ. Genova, X.,
1891, p. 82.

3 ♂♂ Trincomalee, September, December, 1900. 2 ♂♂
Kandy, May, 1907. 1 ♂ Kandy, May, 1909. 1 ♂ Puttalam,
January, 1910.

1 ♀ Trincomalee, December 9, 1920.

Ranges through India to Burma and Lower Siam. The Ceylon specimens are remarkably small, and differ from typical examples of *hisopa* in having a black mark on the dorsum of the eighth segment of the abdomen in the male. In size and general appearance they approximate to *A. bo neense* Ris, the smallest species of the genus, which is itself possibly an extreme race of *hisopa*. Mr. Green's specimens agree closely with an example from Cochin which I regarded as belonging to a distinct race *occidentale*. Fraser has described (*loc. cit.*) a race from Mahableshawar as race *krishna*. The Ceylon specimens differ chiefly from the specimen from Cochin State in their slightly smaller size. In view of the tendency which this species shows to develop local races, it is quite likely that the Ceylon form may ultimately require recognition.

♂ Length of abdomen 21 mm., of hind-wing 13·5 mm.

♀ Length of hind-wing 13·5 mm.

Post-nodal cross nerves on fore-wing 9.

77.—† *ONYCHARGIA ATROCYANA* Selys.

Onychargia atrocyana Kirby, "Dragonflies of Ceylon,"
p. 563.

I have seen examples from Burma, and from Borneo, which is probably its eastern limit. Major Fraser tells me (*in litt.*) that he has specimens from Coorg.

78.—*ISCHNURA SENEGALENSIS* (Ramb.).

Micronympha senegalensis Kirby, "Dragonflies of Ceylon,"
p. 546.

1 ♂ Trincomalee, September 8, 1909.

Ranges over the whole Oriental region.

79.—*ISCHNURA AURORA* (Brauer).

Micronympha aurora Kirby, "Dragonflies of Ceylon," p. 564.

1 ♂ Kandy, May, 1907. 1 ♂ Hakgala, August, 1911.

1 ♀ Peradeniya, February 17, 1911; "caught at light."

Ranges from India and Ceylon to New Caledonia and Fiji.

80.—*CERIAGRION CERINORUBELLUM* (Brauer).

Ceriagrion cerinorubellum Kirby, Cat. Odonata, p. 154.

1 ♂ Undugoda, August 29, 1909. 1 ♀ Ambalangoda,
March 1, 1911.

This species ranges as far as East Borneo.

81.—*CERIAGRION COROMANDELIANUM* (Fabr.).

Ceriagrion coromandelianum Kirby, Cat. Odonata, p. 154.

1 ♂ Trincomalee, December 30, 1900. 3 ♂♂ Trincomalee,
September 8, 1909.

1 ♂ Kandy, May, 1893. 2 ♂♂ Kandy, July 10, 1910.

1 ♂ Chilaw, January, 1910.

2 ♂♂ Puttalam, January, 1910.

1 ♀ Chilaw, January, 1910. 1 ♀ Trincomalee, September 3,
1909. 1 ♀ Jaffna, September, 1911.

♂ Kandy, "Thorax bright green, darker above; head reddish above, yellow below, eyes green; abdomen gamboge yellow."

One of the commonest of Oriental species; ranges to Sumatra and Java.

82.—PSEUDAGRION RUBRICEPS Selys.

Archibasis ceylonica Kirby, "Dragonflies of Ceylon," p. 564.

Pseudagrion rubriceps Kirby, Cat. Odonata, p. 153.

Pseudagrion rubriceps Laidlaw, Rec. Indian Museum,
XVI., Pt. II., p. 194.

1 ♂ Trincomalee, September 8, 1909. 2 ♂♂ Kandy, July 10-11, 1910.

2 ♀♀ July 10-11, 1910.

Common in Peninsular India ; ranges as far as Java, but is not known from Borneo.

83.—* PSEUDAGRION sp. (Text Figs. 15a, 15b.)

1 ♂ Batticaloa, August, 1911. (In excellent preservation.)

Colour generally greenish-blue, with black markings.

Head : upper lip, ante- and post-clypeus olive-brown. The rest of the anterior surface of the head blue, as far as the level of the anterior ocellus. Dorsal surfaces black, with large post-ocular spots of blue.

Prothorax blue at the sides and below ; black above, with paired blue spots.

Synthorax : dorsum black, with broad antehumeral bands of blue ; sides and ventral surface blue. Legs : femora blue with broad black band on posterior surface, tibiæ and tarsi brownish-yellow with black apices.

Abdomen : first segment blue, with square dorsal mark of black colour at its base. Second segment blue with a black mark shaped like a goblet with a short stem. the foot of the stem resting on the apex of the segment. There is also a fine longitudinal line of black extending in the middle line to the base of the segment. Segments 3-6 are blue laterally and ventrally, each with a longitudinal bronze-black band on the dorsum. This band is finely pointed anteriorly and does not reach the base of the segment, apically it widens suddenly close to the margin to form a black ring encircling the end of the

segment. Segment 7 has a similar black band, which is however wider, blunt anteriorly ; segments 8·9 are entirely blue save for a narrow apical ring of black, whilst segment 10 is blue with a square black mark covering the dorsum.

Length of abdomen 30 mm.. of hind-wing 21 mm.

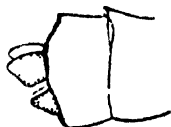


FIG. 15A.—Anal appendages of *Pseudagrion* sp. ♂ seen from the side.

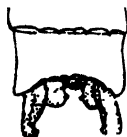


FIG. 15B.—The same viewed from above.

Anal appendages black. Upper pair not bifid, irregularly triangular in outline when viewed from the side. Each is strongly hooked inwards at its apex, and has a shelf-like projection on its inner side.

The lower pair are conical, looked at laterally. When viewed from above each is seen to carry a short inwardly directed tooth near its apex.

This species is very like *P. microcephalum* at first sight. It is readily distinguished by the non-bifid upper anal appendages, which are quite unlike those of the form of *microcephalum* found in Ceylon. Since only a single specimen is included in the collection. I think it wise to leave its exact status undefined.

84.—*PSEUDAGRION MICROCEPHALUM* (Ramb.).

Pseudagrion microcephalum Kirby, "Dragonflies of Ceylon,"

Pseudagrion microcephalum Ris, Supplementa Entomol..

No. 5, pp. 40-43. Text Fig. 13·19.

1 ♂ Trincomalee, January 2, 1901.

"Eyes pale blue, mouth blue, thorax black with blue lateral stripes. Body olive-green, end of segments pale blue; last two segments pale blue divided by black line. Legs and under-surface of body and thorax pale bluish-white."

Common in India and found throughout the Oriental region and as far as Queensland.

85.—* *ENALLAGMA MALAYANUM* Selys.

Enallagma malayanum Kirby, Cat. Odonata, Ris, in

L. Schultze, Forschungsreise in wesentlichen a.

zentralen Südafrika 1903-1908, (Gustav Fischer

Jena. 1908, p. 313.

1 ♂ Trincomalee, September 21, 1910.

First recorded for Ceylon by Ris (*loc. cit.*), otherwise known only from Java.

86.—*AGRIOCNEMIS PYGMAEA* Selys. (Rambur ?).

Agriocnemis pygmaea Ris, Supplementa Entomol.

No. 5, 1916., pp. 20-22.

Agriocnemis velaris Kirby, "Dragonflies of Ceylon," p. 564.

3 ♂♂ Trincomalee, January 10, 1901. ("Thorax striped alternately with black and pale green. Body upper side dark olive-green, under side pale green, last segments rufous")

1 ♂ Trincomalee, September 8, 1909.

1 ♂ Ambalangoda, February 28, 1911. 2 ♂♂ Peradeniya, May 4, 1911.

2 ♀♀ Trincomalee, December 9, 1900 (orange). 1 ♀ Ambalangoda, November 28, 1911 (orange).

1 ♀ Trincomalee, September 4, 1910 (green).

Ranges from Ceylon and India to Queensland.

87.—† *AGRIOCNEMIS FEMINA* Brauer.

Agriocnemis femina Ris, Supplementa Entomol, No. 5, 1916, pp. 22-26, Text Fig. 3·7.

Recorded by Ris for Ceylon. Occurs throughout the Oriental region and as far as the islands of Torres Straits.

88.—* ? GENUS ? SPECIES.

A single ♀ Ambalangoda, March 1, 1911.

In its general characters this specimen comes near the group to which *Agriocnemis* belongs. It has the arculus well distal to the second antenodal nerve, the quadrangle rather short, and with its distal side not very oblique; the wing ceases to be petiolated well before the level of Ac, and there is no apical spur on the sternite of the eighth segment of the abdomen.

The size is a little larger than in *Agriocnemis*, and the colouring is different. Generally speaking it is rich brown with pale (? blue) post-ocular linear marks, the sides of the synthorax pale brown shading ventrally to pale blue.

Legs pale brown, with dark brown apices.

Segments 2·8 of abdomen with small triangular, basal mark of blue on the dorsum, this mark is largest on the eighth segment.

Possibly this specimen is allied to *Mortonagrion* of Fraser; the posterior margin of the prothorax is similar to that found in females of *M. varralli* Fraser, and the colouring is similar. The wings are slightly tinged with brown.

H. W. 12·5 mm., abd. 20·5 mm.

The species noted below have been omitted from the list.

Neurothemis ceylanica (Brauer).

This is regarded by Ris as a name applied to a race or variety of *N. fluctuans* a Malayan species which does not occur in Ceylon.

Rhyothemis phyllis (Selys.).

Given in his list by Kirby on the authority of de Selys. The species is Malayan and its occurrence in Ceylon improbable.

ADDENDA.

Since these notes were written I have named and described the *Heterogomphus* (No. 10, of this list) as *Heterogomphus ceylanicus*, in an account of the Gomphine dragonflies of India. (Laidlaw, Rec. Ind. Mus., XXIV., p. 412, 1922). The Nilgiri species captured by Major Fraser is quite distinct therefrom.

The race of *Indothemis limbata* (No. 28) has been named by Mr. Campion *Indothemis limbata Sita*. (Ann. Mag. Nat. Hist., 9, XI., p. 28, Text Fig. 1923).

Lastly the specimens listed above as *Aciagrion hisopa* (No. 76) belong rather to a distinct species *A. occidentale* Laidlaw, found also in S. India. A full description of this and of some other species of the genus is now awaiting publication. Reference should here be made to a series of papers written by Major Fraser and published in 1922-23 in the Journal of the Bombay Natural History Society, entitled Dragonfly collecting in India.

He has listed 354 species for India and Ceylon ; a very large increase on all previous lists. As his additions are entirely Indian, and as even since the completion of the last part of his series published in December, 1923, he has, I believe, secured about ten further unrecorded or new species, it is evident that careful collecting will add to the Ceylon list very considerably.

NEW CEYLON DIPTERA.

PART III.

BY RONALD SENIOR-WHITE, F.E.S., F.R.S.T.M. & H.

Malariologist, The Kepitigalla Rubber Estates, Ltd.

I HAVE included in this part the descriptions of several Diptera from India, which have been sent me from time to time for determination, as, though not yet known from Ceylon, they are quite likely to occur here also.

Mycetophilidae.

PLATYROPTILON TALAROCEROIDES S.-W.

This insect, which I described in the first part of this paper as a *Platyura*, should be transferred to the above genus, on the authority of Mr. F. W. Edwards of the British Museum. The only other two species of the genus are found in South America. My type, as several fresh specimens taken subsequent to the writing of the description show, is an undersized specimen, and the average length exceeds that given by one to two millimetres. One specimen has been placed at South Kensington.

PLATYURA TRIPUNCTATA sp. nov.

Female.—Head: Frons yellow with short black pubescence, face concolorous, palpi brownish-grey. Antennae, scape and extreme base of first flagellar joint yellow, remainder brownish-grey.

Thorax: Yellow with black pubescence. Hind margin of mesonotum with three large, somewhat square-shaped black spots, from the middle one of which, the largest, precede three diverging black lines, barely reaching the fore margin, the middle one the faintest but proceeding the furthest. Scutellum black. Pleurae yellowish, metapleuron with a dark bar. Metanotum blackish above and yellow below.

Abdomen: Dark yellow, hind margins of the segments narrowly darkened.

Legs: Pale yellow, tibiae and tarsi darkened.

Wings : Clear. Petiole of fourth vein about one-third the length of the fork. Halteres pale, capitellum slightly brownish.

Long : 2-2½ mm.

Described from two females, both in good condition, taken on windows, Sudu-ganga, Matale, Ceylon, on May 24 and 26. 1922. Type and co-type in my own collection.

This species separates from *indistincta*, Brunetti, on the very distinct thoracic pattern.

ACNEMIA ASIATICA sp. nov.

Male.—Head : Yellowish, the frons thickly covered with black hairs. Face distinct. Antennae yellow, the bases of the flagellar joints increasingly blackened outwardly. Palpi with basal joints yellow, the two outer black. Eyes minutely pale pubescent.

Thorax : Dull yellow. From each shoulder a dark line converging medially before root of scutellum, each with a row of small but closely set bristly hairs. Shoulders and notopleural suture bristly. Pleurae concolorous. Spiracular area and mesopleuron blackened. Metapleuron with several longish bristles. Scutellum concolorous with mesonotum, marginally beset with numerous fine long bristles. Metanotum with sub-median rows of long bristles on lower half.

Abdomen : Seven distinct segments before the genital rings, elongate, black, dorsally with narrow yellowish junctions, which are rather broader laterally, the whole with short, thick hairs dorsally and ventrally. Genitalia prominent, blackish, hairy.

Legs : Anterior coxae black, hind pair yellowish except extreme tips, which are black. Femora yellow, tip of hind pair blackened. Tibiae and tarsi brown, the latter rather darker. Mid tibiae with only two rows of setulae apparent.

Wings : No sub-costal cross-vein. Yellowish. A dark costal patch between humeral cross-vein and tip of sub-costa. not descending behind vein I except in the marginal cell which is darkened from its transverse origin to a point just beyond the tip of the sub-costa. All apical third of wing darkened. Wing not as long as the abdomen. Halteres with yellow stem and very elongate blackened capitella.

Long : 6 mm.

Described from a unique male, legs damaged but otherwise in good condition, taken dead in cobweb, Pattipola Resthouse, Ceylon, 6,201 feet, on May 5, 1923. In my own collection.

Probably a new genus will be required for the reception of this species. The absence of the sub-costal cross-vein and the additional visible abdominal segment, making the relative wing-abdomen length shorter, are contrary to Johannsen's definition of Winnertsz' genus, but knowing that a revision of the Oriental *Mycetophilidæ* is in preparation by Mr. Edwards, I refrain from new generic erection meanwhile.

The bristly metanotum is a most exceptional character.

EXECHIA CRISTATOIDES sp. nov.

Male.—Head : Frons black, covered with somewhat widely separated silvery pubescence. A row of black supra-ocular bristles. Eyes minutely black pubescent. Antennae, scape and first flagellar joint yellow, remainder black with thick white pubescence, giving the whole a grey appearance.

Thorax : Dorsum dark brown with a yellow V-mark from the anterior margin to the base of the scutellum, the anterior margin itself very narrowly dark, with a T-form prolongation in the centre of the yellow V-mark for a short distance posteriorly. Scutellum and pleuræ dark brown. Metanotum black. Edge of dorsum from wing roots round anterior margin with a row of bristles, the hindmost of which is very strong and long. V-mark edged with bristles as far as level of wing roots, behind which they become very weak and merge in the general microchaetae of the dorsum. The bristles of the V-mark are outwardly directed and decumbent, not forming a true crest. Humerus with three erect and two decumbent bristles, the three lowest the strongest. A very strong post-alar. Scutellar pair apical, divergent, erect. Metapleuron with about three weak bristles. All bristles black.

Abdomen : Strongly laterally compressed, black, bristly. Base of first segment and apex of sixth broadly pale yellow. the junction of the first and second very narrowly so. Third and fourth yellow ventrally, the colour extending half way up the sides. Genitalia yellow, very complex, each side-piece above with a long, bristly process.

Legs : Whitish, tips of hind femora slightly, and all tarsi darkened.

Wings : Smoky-grey, fork of fifth vein short. Halteres whitish-yellow.

Long : $2\frac{3}{4}$ mm.

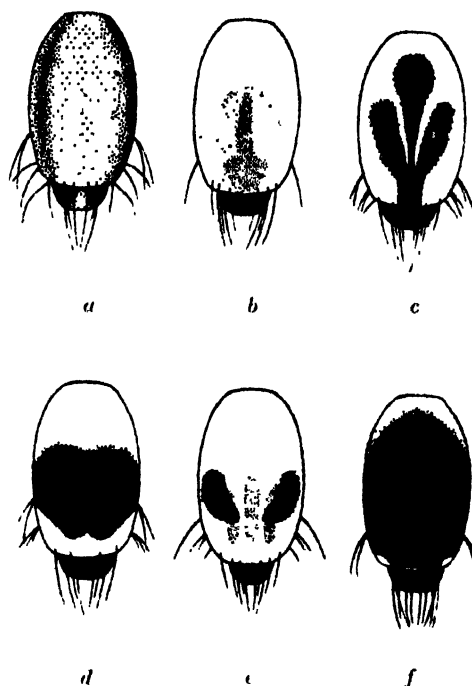
Described from a unique male in perfect condition taken on a window, Sudu-ganga, Matale, Ceylon, on March 4, 1922. In my own collection.

Differs from *cristata*, S.-W., by the absence of the posterior dark patch on the dorsum, the much paler legs, and the more shortly forked fifth vein. From my *paramirastoma*, with which it runs out in my key in *Mem. Dept. Agric. India*, Vol. VII., pp. 118-119, the thoracic V-mark and the pale halteres will at once distinguish it.

DELOPSIS Skuse.

In describing yet another new species of this genus it seems suitable to offer a key to the present muster of the Indian species, which have gone up considerably in number since the publication of the "Fauna" volume. (See Text Fig. 1.)

- 1.—Thorax all ferrugineous. or only slightly brown marked 2
- Thorax yellow with black markings 3
- Thorax black, with or without touches of yellow laterally 6
- 2.—Scutellum without golden pilosity *setosiventris*, S.-W.
- Scutellum with golden pilosity .. *ferruginea* S.-W.
- 3.—A black saddle-mark on hinder half of meso-notum 4
- No such mark 5
- 4.—Scutellum black *nigroflava* S.-W.
- Scutellum yellow *brunettii* Edws.
- 5.—Meso-notum with anterior black spot continued posteriorly as a stripe ; sub-dorsal black stripes *pectenipes*, S.-W.
- Meso-notum with two black lunules, *bikunulata*, sp. n.
- 6.—Sides of thorax grey .. *griseolateralis*, Brun.
- Fore margin and humeri yellow .. *flavohirta*, S.-W.

FIG. 1.—*DELOPSIS* spp.

- | | | |
|----------------------------|-------------------------|-------------------------|
| (a) <i>ferruginea</i> . | (c) <i>pectenipes</i> . | (e) <i>bilunulata</i> . |
| (b) <i>setosiventris</i> . | (d) <i>nigroflava</i> . | (f) <i>flavohirta</i> . |

DELOPSIS BILUNULATA sp. nov.

Male.—Head: Yellow. Antennae and palpi concolorous, the last ten joints of the former darkened, the amount of infuscation increasing apically.

Thorax: Dorsum and pleurae yellow, the former with short golden hairs, and, on posterior half, three obscure brownish stripes, over the outer of which on each side is a well-defined black lunule. Hypopleura and a small area below the wing roots blackened. Scutellum black. The usual six prescutellar and four scutellar bristles.

Abdomen: Yellow, the segments blackened apically dorsally, the infuscation covering all the first two, less than half the third and fourth and only the apical margin of the

fifth segment, and absent on sixth and seventh, which, with the small yellow genitalia are covered with short golden hairs. Just before the apex of the second segment on the mid-line of venter is a pair of decumbent bristles as in my *setosiventris*, which Mr. Edwards considers to be a generic character.

Legs : Whitish, apices of coxae slightly blackened. Hind tibiae with the usual three rows of setae.

Wings and veins yellowish, halteres pale whitish-yellow.

Long : $2\frac{3}{4}$ mm.

Described from a unique male in good condition, taken in garden, Sudu-ganga, Matale, Ceylon, on March 17, 1922. In my own collection.

Bibionidae.

SCATOPSE ZEYLANICA sp. nov.

(Text Fig. 2.)

Male.—Head : Shining black. Eyes closely approximated just above level of antennae, but more widely separated above and, viewed from in front, seemingly divided into two halves by the antennal plate. Antennae black, ten-jointed, with white pubescence, the tip of the second scapal joint appearing white. Palpi greyish.

Thorax : Black with short concolorous pubescence. Scutellum similar, the hairs longer.

Abdomen : All black, the genitalia small, concealed.

Legs : Femora and tibiae black, tip of front tibiae and all tarsi yellow. The fore femora are only very slightly swollen, and the tibiae not clavate.

Wings : Clear. Fourth vein simple, fifth and sixth closely approximated, seventh distinct, bisinuate, and near its tip apparently with a re-curved appendix, which is very faint. Halteres black.

Long : $1\frac{1}{4}$ mm.

Described from a unique male in good condition, * taken on window in company with specimens of both sexes of *Scatopse brunnescens*, Brun., at Sudu-ganga, Matale, Ceylon, on July 17, 1922. In my own collection.

Now headless.

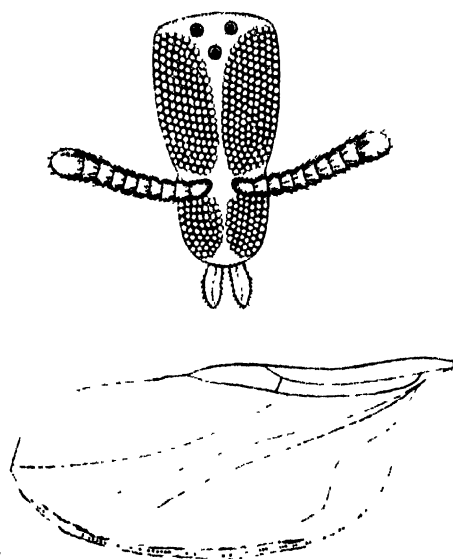


FIG. 2.—*Scatopse zeylanica*, head and wing

Unless a new genus be erected for it, this species will apparently have to remain as an unconformity in *Scatopse*. The ten jointed antennae and unarmed front tibiae prevent its inclusion in *Aspistes*, the only genus of the family with simple fourth vein.

It may be noted that the point of issue of the fourth vein, behind the basal section of the third, is against Brunetti's interpretation of the venation in this genus.

Dixidae.

DIXA ZEYLANICA sp. nov.

Male.—*Female*.— Head : Vertex and frons pale grey-brown with some shimmering whitish pubescence. Face blackish with some pale pubescence. Proboscis dark brown, blackened basally. Palpi very dark brownish. Antennae, the first joint large, globular, bright ochreous-yellow, the flagellum very dark brown. Five joints can be distinguished, accounting for less than half the total length, of which the remainder is of an indefinite number of joints. Neck yellowish-brown above, darker below.

Thorax : Ground colour of dorsum pale brownish with whitish shimmer. A median stripe from neck to middle, orange-brown anteriorly, darkening to very dark brown posteriorly, and gradually broadening. Beyond the middle abruptly narrowed and continued to root of scutellum as a fine, black, not very distinct, median line. At sides of dorsum, commencing level with the broadest part of the median stripe, and continued to scutellum, a black stripe on each side, as broad as the broadest part of the median. The area between these stripes is grey-brown, darker than the ground colour in the anterior region. Pleurae yellowish-brown, with black irregular marks on the pro-, meso-, and ptero-pleurae, and with the major portion of the sterno- and meta-pleurae blackened. Scutellum black, with yellowish band beneath, remainder of meta-notum black. A fringe of strong, short hairs on the scutellar margin.

Abdomen : Black, with some sparse short hairs. Male genitalia very small, the claspers pale yellowish-white. Valves of ovipositor black.

Legs : Coxae yellow, the front pair blackened on the basal half. Femora yellowish-brown, the tips black, with a paler pre-apical ring. Anterior tibiae black with pale basal ring. Hind tibiae yellowish-brown, paler basally, and with apical shining black clavate area. Tarsi very dark brown, the base of the first joint paler.

Wings : In male clear, with yellow first vein; in female greyish, with first vein dark. A more or less circular black patch centred over the fork of II. and III., not touching I., and with extension along anterior cross-vein. A dark stripe below vein I., before origin of II. A faint infuscation along the outer two-thirds of III. A circular black patch over middle of V. and an indefinite dark area in second basal cell above V. midway from the black patch to the fork of the vein. A fuscous suffusion over lower branch of V and in axillary region. In the much less maculate male wing only the prefurcal and fifth vein spots are visible, together with the suffusion over the lower branch of the latter. Halteres yellow.

Long : Male 2 mm. Female $3\frac{1}{2}$ mm.

Described from two of each sex bred from stream, Suduganga, Matale, Ceylon, during March, 1923. Types on March 26 to 28, 1923. All in my own collection. Additional specimens have since been bred from the same location.

Closely allied to *D. montana*, Brun., from which it differs *inter alia* by the much greater colour difference between the scape and flagellum, the black scutellum, and the wing pattern.

This is the first species of the genus to be described from India, south of the Himalaya, and again emphasises the close generic connection existing between the Ceylon Hills and that range.

The larvae are not seldom come across in mosquito survey work. They are black in colour, and move with the usual looping motion of the genus. They possess considerable powers of attaching themselves to the surface of the dipper, and even to the walls of glass tubes, and can wriggle clear of the water film up the sides of the breeding bowl. They usually pupate thus attached, but I have also, in the laboratory, found the pupae floating free in the water. This, however, is not apparently normal, and the tail is less recurved than in fixed pupae, and the mortality is higher. The capacity to attach itself to any surface, in larva and pupa, is doubtless an adaptation to life in hill torrents.

I have seen larvae, probably of the same species, in the Marlbe Valley in Kurunegala District at about 600 feet elevation. The streams in the Pattipola district (6,200 feet). swarm with the larvae of a species of this genus, but the colour is yellowish-brown, and I imagine that these represent another, and probably undescribed species. All that I collected were attacked by a fungus during transit to the low-country.

Tipulidae.

GERANOMYIA GENITALOIDES sp. nov.

Female.—Head: Occiput pale whitish-grey, with a pair of large black spots nearly meeting in the middle behind, the vertical line consisting of a small grey diamond-shaped spot in front of neck, attached at the angle of its long side to a white line which gradually broadens to vertex. Sub-holoptic,

frons represented by a narrow whitish-grey line only. Proboscis very dark brownish-black. Palpi situate at half its length, very small, black. Antennae with the first scapal joint twice the second, greatly narrowed apically, and apparently flattened dorso-ventrally, so that viewed laterally the second scapal appears to be attached to a very narrow first joint; viewed from above the first scapal appears rather broader than the second. Flagellum normal, joints distinct.

Thorax: Ground colour of dorsum cinereous. A pair of median black stripes, fused anteriorly and reaching to neck, presuturally. They are broadest behind the humeral calli, and in this region show signs of being each divided by an indistinct paler line, so that almost four stripes seem to be present. Presuturally also there is a pair of broad sub-dorsal stripes above the noto-pleural suture, joined along the posthumeral depression to the median stripe. Post-sutural calli each with an irregular dark patch, the pubescence in the median area appearing brassy in certain lights. Pleurae yellowish-brown, grey dusted, especially the meta-pleuron. Scutellum dark brown, shining. Metanotum yellowish-grey dusted.

Abdomen: Dorsum very dark brown, venter more yellowish. Valves of ovipositor shining brownish-yellow.

Legs: (Front pair missing in type). Front legs all yellowish. posterior pairs, coxae yellowish-brown, remainder very dark brown, the femora noticeably and the tibiae slightly yellowish, basally.

Wings: Clear, very iridescent, ground colour distinctly yellowish-grey, unmarked, save for pale brown stigma situate over marginal cross-vein. Venation exactly as described for *G. genitalis*, Brun. Veins brown, with short hairs. Halteres dark brownish, stems very thin and rather paler.

Long: (Without proboscis), $4\frac{1}{2}$ mm.

Described from two females in good condition, except for the loss of the front legs in type, and middle legs in co-type. taken at Sudu-ganga, Matale, Ceylon, the type on scrub, at dusk, August 27, 1919, the co-type at flowers of *Mikania*, at dusk, February 4, 1920. Both in my own collection.

Amplly distinct from *genitalis* and *nigronotata*, Brun. In the latter, of which I possess a dozen specimens from the same

locality as the present species, Brunetti makes no mention of the two patches of silvery shimmering pubescence on each side of the "dead black" spot before the wing base. I have hitherto refrained from describing this species in earlier parts of this series, in the hope of obtaining the male, but it is evidently very rare.

LIMNOBIA ALBIPES sp. nov.

Female.—Head: Occiput very dark grey, frons linear, whitish. Proboscis brown, palpi, and antennae blackish.

Thorax: Brownish-yellow, dorsum unmarked. Post-sutural calli very slightly darker. Pleurae with broad dark stripe reaching from neck to base of abdomen, above this, concolorous with dorsum, below, paler whitish-yellow. Scutellum very dark brown, metanotum rather paler.

Abdomen: Black. Eighth and ninth segments and the valves yellow, as also sometimes an indefinite median area on second and third segments. Venter with apices of fifth, sixth, and seventh, and all the eighth yellow. Bases of valves ventrally black.

Legs: Coxae and base of femora pale yellowish, remainder of femora and basal three-quarters of tibiae brown. Apical quarter of tibiae and first four tarsal joints dirty-white. Fifth tarsal joint darkened, sometimes hardly noticeably.

Wings: Dark grey, highly iridescent, unmarked, stigma barely noticeable on close examination. Auxiliary vein ending just before the origin of the third vein. Sub-costal cross-vein present. Second vein commencing in mid wing, the distance along first vein from its origin to tip of auxiliary approximately equal to distance thence to the tip of the first vein. Prefurca three-fifths the length of the rest of the second vein. Basal part of third thrice the length of the anterior cross-vein, situate at upper basal angle of discal cell, which is approximately quadrangular, twice as long as broad, and about as long as the third posterior cell. Posterior cross-vein just before or beyond the lower basal angle of the discal cell. Halteres with black stem and brown capitella, translucent.

Long: $4\frac{1}{2}$ mm.

Described from three females, all taken on windows, Sudu-ganga, Matale, Ceylon, on August 22, 1919, November 12, 1919 (type), and January 12, 1920. All in my own collection.

At once separable from *niveipes*, Brun., on the white metatarsi.

ORIMARGA ASSIGNATA sp. nov.

Male.—Head: Back of head brownish, lateral post-ocular region greyish. Frons wide, brownish-grey, face yellowish-brown. Proboscis concolorous, rather darker apically. Palpi very dark brown. Antennae very dark brown throughout, the first scapal joint twice the second and much narrower.

Thorax: Brownish-yellow, the median post-sutural area paler, unmarked, with a little fine grey pollinosity. Pleurae yellow, concolorous with the pale area of the mesonotum, as is also the scutellum and metanotum.

Abdomen: Brownish-yellow, laterally unmarked. Genitalia concolorous, without stiff black hairs below.

Legs: Pale brownish, coxae and bases of femora rather paler yellowish.

Wings: Clear. Venation exactly as described (but not figured), for *peregrina*, Brunetti, Halteres pale yellowish-brown.

Length: $4\frac{1}{2}$ –5 mm.

Described from three paratype males, none in perfect condition, all taken at Sudu-ganga, Matale, Ceylon, one "at light" on October 24, 1919, the others in garden on November 18, 1919, and January 4, 1920. All in my own collection.

Differs from *peregrina* by the unmarked thorax. The genitalia appear different, but little reliance can be placed on descriptions of the undissected organ.

STYRINGOMYIA MARMORATA sp. nov.

Male.—Head: Depressed. Back of head and frons dull greyish-brown. A pair of strong post-verticals and about

three pairs of irregularly placed strong frontals, all proclinate. A post-ocular row of much weaker bristly hairs. All bristles black. Face and proboscis dark brownish, the former with some bristles, palpi concolorous, with the basal half of third and all fourth joint, except extreme tip, whitish. Antennae, scape dark brown, first joint cylindrical, twice the second, which is pyriform, the narrow end inmost. Flagellum brownish-white. First scapal with an apical above, second scapal with many more median bristles, flagellar joints each with a basal verticil of several long black bristles.

Thorax : Collar and humeri yellowish-white. Mesonotum velvety-black, with a U-shaped pale yellowish-white mark presuturally, and the inter-callary post-sutural area pale. Pleurae brownish, sternopleuron yellowish-white. Scutellum black, lateral lobes pale, forming part of post-sutural pale area of meso-notum. Metanotum black. From each of the anterior angles of the thorax a pair of strong black bristles projects forward over the head. The humeri each bear a pair of strong, anteriorly directed bristles. The mesonotum has a sub-dorsal row of black bristles which, just before the anterior end of the pale U-mark, are approximated into a regular crest of black, spiny bristles, all slightly reclinate. The rows continue to the inner angles of the U-mark.

There is a strong upright black bristle on the inner margin of each post-sutural callus, two or three very strong supra-alars, outwardly and laterally directed, and the scutellum bears a pair of upright, lightly crossed apicals.

Abdomen : Black, the apices of the segments very narrowly pale. The first six segments bear an indefinite median pale yellowish-white band, much more definite on the last of those, but broadly interrupted dorsally. Seventh segment laterally compressed, blackened dorsally, with big yellowish lateral patches. Venter mottled, dirty whitish-yellow and black, no pattern. Genitalia swollen, large and complex, rather concealed.

Legs : Coxae dark brown, front pair pale apically. Front trochanters pale, posterior pairs dark. Front femora pale, clavate, with three dark rings, of which the first covers the

apical half of the shaft, the second most of the basal half of the clavate area, whilst the third, half the breadth of the two others, is sub-apical. Tibiae whitish, with narrow black rings at one-third and apically. Tarsi with tip of first and all fifth joint black, otherwise white. Middle legs similar to front, but the dark ring on the shaft of the femora evanescent. Hind legs, femora less clavate than the anterior pairs, with sub-median and apical broad black rings, tibiae and tarsi as anterior pairs.

Wings: Pale grey. Sub-costal vein ending opposite the origin of II., the cross-vein at its tip. II simple, III. running straight to margin. Anterior cross-vein joining III to discal cell. Second posterior cell petiolate. Posterior cross-vein nearly at middle of discal cell. VII abruptly turned down before tip. Costal, first and prefurcal veins yellow, except the two latter where they pass through the dark areas, other veins dark. Wings marked as follows:—A dark mark below humeral cross-vein, a grey patch in both basals before the origin of the prefurca, a grey band from in front of tip of sub-costal across middle of both basals to VI. A broader, and anteriorly much darker, band from II over anterior cross-vein, base of discal cell, dividing in second basal, the outer branch running over posterior cross-vein to tip of VI, the inner at one-third the distance to VII. There are several pale spots in this band. Sub-costal cell with a median and pre-apical dark markings, the former large and including a small clear costal spot. The posterior and anal cells contain a maculation of grey spots centered over the petiole of the second posterior.

Halteres pale yellowish, tip of stem brownish.

Long: 7 mm.

Described from a unique male in fair condition taken at Sudu-ganga, Matale, Ceylon, on March 18, 1922, flying in garden at dusk.

The species bears a superficial resemblance in wing and leg coloration to *G. cyanea*, but altogether lacks the violaceous body colour of the latter. The remarkable development of bristles is unlike anything else known to me in *Limnobiinae*.

Leptidae.**RHACHICERUS ATERRIMUS** sp. nov.

Male.—Head: Frons and face shining black, the former longitudinally striated, the latter with a patch of greyish pubescence at level of antennae laterally, invisible viewed from below. Proboscis and palpi black. Antennae black, 2 + 15 jointed, of which the first fourteen flagellars have the usual decumbent finger-like processes, each of which is nearly as broad as the main joint is long, and the median ones are nearly half as long as the whole flagellum. Terminal joint simple, shorter than the process of the penultimate, lightly bisinuate and incrassate on basal two-thirds, with a preapical bristle in the curve of the upper bend.

Thorax: Shining black, the shoulders blackish-yellow obscurely.

Abdomen: Shining black, pubescent.

Legs: Black, femora and tibiae with thick, short whitish hairs. Base of hind femora, anterior knees, and first two or three tarsal joints whitish, the tips of the latter blackened, especially the hind metatarsus

Wings: Grey, slightly darker along fore border, with a large, undefined stigmatic darkening. Venation exactly as in *unicinctus*, Brun. Halteres white with stem brownish.

Long: (Without antennae), 6 mm.

Described from a unique male in perfect condition, taken on a flowering tree at edge of forest, Pattipola, Ceylon, 6,200 feet, on May 5, 1923. In my own collection.

Amplly distinct from the other described Oriental species.

Tabanidae.**TABANUS ANGUSTILIMBATUS** sp. nov.

Female.—Head: Frons in length ten times its width at vertex, cinereous, with a yellowish-brown tinge above, and narrowed anteriorly by a full half. Callus fusiform, touching the eyes, its extension broadening slightly above and reaching

nearly to three-quarters the distance to vertex. Face grey, beard whitish. Antennae, first joint black, with apical black pubescence, with a whitish-grey patch basally above; second joint small and black; third joint with the first annulation very dark brown, with prominent tooth, the remaining annulations black. Palpi pale lilac-grey, apical half more yellowish-grey, the outer two-thirds with rather stiff black hairs, the tips exteriorly appearing almost black. Proboscis black.

Thorax: Dorsum dark slate-grey with only the barest traces of paler stripes, such pubescence as is present, black, except for some brassy-white hairs before the concolorous scutellum, and in the lateral fossae. Lateral hairs black. Pleurae paler grey, with thick white hairs

Abdomen: Very dark brownish-black, except the first joint, dark greyish, and second, dark brown. Second to sixth segments narrowly margined yellowish-white posteriorly, and also the lateral margins on the third to fifth segments.

Venter similar.

Legs: Coxae grey, slightly darker than the pleurae. Femora black, with traces of yellowish knee-spots. Front tibiae with basal third pale brownish with white hairs, remainder black; posterior pairs yellowish with apical fifth black.

Posterior femora and tibiae with white hairs. All tarsi black.

Wings: Clear, stigma pale brownish-yellow. Vein III. without appendix to the upper branch. Halteres with stem and capitella brownish-white above.

Long: 13 mm.

Described from a perfect specimen taken at light, Kepitigalla, North-Western Province, Ceylon, on March 16, 1923. In my own collection.

A second specimen in rather rubbed condition, also taken at light at Marlbe (about three miles distant from the type locality and about 600 feet lower elevation), on March 8, 1921, has the first two antennal joints yellow, except the tip of the first above, which is black, and the posterior femora distinctly yellow-brown on the underside. The pale yellowish lateral margins to abdominal segments five to seven are also much more distinct.

The species runs out at couplet 60 of Miss Ricardo's table of the Indian species. It is, however, a smaller species than either the Nicobar or Bornean species running to the same couplet, and separates from them on the clear wings and not all-black legs.

TABANUS DEMELLONIS sp. nov.

Female.—Head: Frons six to seven times as long as its width anteriorly, where it is hardly narrowed, dull ashy-yellow. Frontal callus brown, pyriform, not touching the eyes and with fairly stout extension to three-quarters the distance to vertex. Face concolorous with frons. Subcallus pollinose and not distinguished, with a few weak, sparse hairs below of a darker shade. Palpi rather more greyish cinereous. covered on the outer side with short black hairs from base to tip, on inner side pale fawn-grey without any black hairs. Cheeks almost bare, such hairs as there are, concolorous with facials. Antennae, first joint yellowish-grey with black hairs; second with very strong teeth, clearer yellow, with black hairs; third with basal annulation deep orange, the teeth weak and flattened, and apical annulations deep black.

Thorax: Mouse-brown, calli more ashy-yellowish, with traces of four darker stripes. Pubescence very sparse, black and whitish-yellow intermingled. Pleurae yellowish-ashy, with very few pale hairs. Scutellum concolorous with darker part of mesonotum.

Abdomen: Orange-brown, unmarked, darkened on the last four joints or so. Venter similar.

Legs: Yellowish-brown, coxae more greyish. Apical half of front tibiae and the front tarsi blackened, as are the apices of the posterior tarsi slightly.

Wings: Grey, a darker stripe along costal margin from stigma to apex, not sharply defined behind; costal cell dark yellow. There are paler hyaline streaks in all cells from the sub-marginal to the fifth posterior, but not in the basals and discal. Fork of vein III. without appendix. Halteres with stem brown and capitellum more yellowish.

Long: 11 mm.

Described from a unique female in good condition taken on carriage horse, Combarjua, Portuguese India, on June 13, 1920, by Major Froilano de Mello, Director of the Bacteriological Institute of Nova Gôa, in whose honour I have much pleasure in naming it. In my own collection.

In Miss Ricardo's table of Indian species falls into Group X., running out with *diversifrons*, Ric., and separating on the yellowish legs.

Bombyliidae.

EXOPROSOPA AFFINISSIMA sp. nov.

(Text Fig. 3.)

Female.—Head: Frons at widest barely one-third of head. yellowish-grey at vertex and on two spots contiguous to the eyes above antennae, remainder black with black hairs and a sparse scattering of greyish scales. Antennae with first two joints black, third dark brown. Face brown, with black hairs and greyish scales, with a narrow, curved, naked, pale greyish patch below each antenna laterally. Occiput grey with black hairs and a narrow post-ocular fringe of pale scales. Proboscis black.

Thorax: Black with black scales. Collar of dull golden scales, and a few brown scales above wing roots. Scutellum concolorous, with about eight strong apical bristles. Pleurae black, a fan of brown hairs on humeral calli and a few below wing roots. Squamae with greyish scales.

Abdomen: Black, anterior corners of first segment with a tuft of white hairs, a few white scales at anterior corners of second segment, the remainder of the margins of which are brown, third segment with anterior corners with white scales and a lateral tuft of shorter white and longer black hairs, sixth segment with outer third of dorsum on each side white-scaled anteriorly, seventh with a few white scales at anterior corners. Venter brownish, with scattered pale scales.

Legs: Black, fore femora and tibiae brown, darkened at tips and bases, and mid femora slightly brownish on basal half. Posterior femora and tibiae bristly.

Wings: Hyaline, with a black band reaching from just before tip of first vein to middle of second posterior cell, covering all of wing to base except a clear area extending from middle of third posterior cell over outer half of discal and running to margin just behind tip of sixth vein. A pale spot at fork of second and third veins, at fork of fourth (hyaline), over basal section of upper branch of fifth vein, and across base of basal cells. Halteres black with yellowish-white capitellum.

Long: Body 10 mm., wing 11 mm.

Described from a unique female in good condition taken in bungalow, Sudu-ganga, Matale, Ceylon, on February 19, 1922, exploring dark corners. In my own collection.

This species is undoubtedly very closely allied to *Exoprosopalar*, Fb., but is, I think, sufficiently differentiated in the following points to justify its description as new. The frons is nearly half as wide at vertex as at root of antennae, and has no pink or orange tint. The frontal and facial pale areas are not found in *lar*. The first two antennal joints are black, not ferrugineous. The thorax is practically without coloured scales on the disc. The humeral hair-like scales are much darker than those of the fore margin of the thorax. The pleurae are also almost entirely without coloured scales, and the posterior calli are not colour differentiated. The scutellum is black, not reddish-brown. Only the second abdominal segment has any trace of reddish, and the white scales on every segment are much less in extent than in *lar*. The legs are darker. In regard to the wing pattern the colour of the open parts is clear hyaline, not greyish, and the band is black, not dark brown. It reaches the posterior margin beyond the median clear area, which it does not do in *lar*, Brunetti's re-description of which states that the extent of the brown coloration is "only very slightly variable." The halteres have a pale, not black, capitellum. The species is much smaller, only 10 mm., as against 14-16 mm for *lar*.

Mr. Brunetti informs me that the specimens referred to, by him, in his re-description of *lar* in the "Fauna" taken by Col. Yerbury at Mahagany, in the Trincomalee District, which

represent apparently a different species, are in too bad order to use on the points of difference noted for the present species. He also informs me that there is in the British Museum a specimen from the same place, passed by him as true *lar*, in which the apical half of the band reaches the hind margin in the outer half of the third posterior cell only, being greatly narrowed from about the fork of the third vein.



FIG. 3.—*Exoprosopa affinis*.

Empidæ.

ACARTERUS VARIPES sp. nov.

Female.—Head : Upper half of eyes bearing large facets, flattened as compared with the lower half bearing small facets. Proboscis yellow, palpi brown, not very small. Antennae very dark brown, with long arista. Occiput dark greyish.

Thorax : Somewhat shining black, with some sparse brassy pollen, only visible when viewed laterally. Some lateral and a row of dorso-central bristles on posterior side of hump. Scutellum concolorous, with marginal hairs.

Abdomen : Dull black, with some short hairs. Venter not noticeably paler.

Legs : All coxae black, anterior femora and tibiae brown, yellow apically, and at base of tibiae, tarsi yellow. The darkening of the femora and tibiae is much more apparent on front than on mid pair. Hind femora black, some long hairs below. Hind tibiae dark brown, with yellow basal and apical broad rings. Hind tarsi yellow, basal two-thirds of first and all fifth joint dark brown.

Wing : Pale brownish. Anal cell only very slightly longer at lower corner than second basal. Halteres large, black.

Long : $2\frac{1}{2}$ mm.

Described from a unique female, in fair condition, taken at Sudu-ganga, Matale, Ceylon, on July 4, 1919, hovering round scrub along river bank. In my own collection.

Amply distinct from the other two known Indian species by the all-black hind femora.

SYNECHES JARDINEI sp. nov.

Female.—**Head :** Upper eye facets reddish-brown, lower dark brown. Occiput and vertex black. Frons very small, black, shining. Face narrow, dull black. Proboscis brownish-yellow, approximately as long as height of head, directed forwards and downwards. Palpi darker brown, moderately long. Antennae greyish-brown, third joint twice the second, with apical black arista as long as the whole antennae.

Thorax : Strongly humped, black. Some long pre-alars and two dorso-centrals on hinder slope. Scutellum shining, appearing yellowish through thick, dull brassy pollen.

Abdomen : Dull black, with lateral pale hairs.

Legs : Coxae brown, grey pollinose. Anterior legs yellow, front tibiae somewhat darkened, also fifth tarsal joint. Hind femora black, except for extreme base and apical quarter. Hind tibiae brownish basally, remainder and tarsi black. The fifth tarsal joint in all pairs incrassate. Tibiae with long bristles, all legs with softer hairs and pubescence in addition. Hind femora with a single range of strong bristly spines antero-inferiorly, near tip with one or two post-inferiorly. Near the middle the spines as long as width of the incrassated femur, those near the ends of the row shortened.

Wings: Clear brown, the area between veins I. and II. darker. Second basal appearing longer than the anal by reason of the very oblique fork of IV. Halteres black, base of stem yellowish-brown.

Long: 5 mm.

Described from a unique female in good condition taken at St. Vigean's, Bogawantalawa, 4,800 feet, on April 12, 1920, by Mr. N. K. Jardine, of the Entomological Division, Department of Agriculture, Ceylon, after whom I have much pleasure in naming it. In my own collection.

In Brunetti's table of *Syneches* (*sens. lat.*) in the "Fauna" runs to couplet five and there separates on the colour difference between the anterior and hind femora.

SYNECHES PERADENIYAE sp. nov.

Female.—Head: Eyes practically contiguous below and absolutely so above antennae, upper facets reddish-brown and much larger than lower, but the colour difference not so marked as usual. Proboscis brownish-yellow, as long as the height of head, obliquely forward directed. Palpi very thin about as long as third antennal joint, with an apical and submedian black bristle on lower side, each rather longer than a palpus. Antennae, first and second joints greyish-brown, third fulvous yellow, with sub-basal black bristle above. Style two and a half times as long as antennae, basally pale yellow, remainder black.

Thorax: Dull black, some strongish bristles on hinder slope. No fine hairs. Scutellum slightly more brownish, with long hairs intermixed with bristles marginally.

Abdomen: Dull black, some lateral hairs. No golden hairs on fifth sternite. Genital lamellae elongate.

Legs: Coxae black, femora and tibiae very dark brown. Front tarsi concolorous or only slightly paler. Posterior tarsi brownish-yellow, fifth joint incrassate, darkened, especially on hind legs. Hind femora basally incrassate, about five weak bristles below in anterior row and two or three in posterior row sub-apically.

Wings : Clear, veins yellowish. An indefinite faint stigmatic yellowing at tip of marginal cell. First posterior cell, though its bounding veins run parallel apically, distinctly narrower there than above inner half of last section of IV. Anterior cross-vein at one-fifth of discal cell. Second basal and anal cells sub-equal. Halteres dark brown, capitella large, stem rather more yellowish-brown.

Long : $3\frac{1}{2}$ mm.

Described from a unique female in good condition taken in Royal Botanic Gardens, Peradeniya, Ceylon, on May 23, 1920. In my own collection.

There may be some doubt as to whether this species falls into *Syneches* or *Acarterus*. In favour of the former genus is the rather more elongate third antennal joint. In Brunetti's key it runs to *palliditarsis*. Brun. separating on the paler third antennal joint, the absence of golden hairs on the fifth sternite of the female, and the darker tibiae, and the clear wings without noticeable stigma.

It may be noticed that the relative lengths of *palliditarsis* and *fuscipennis* are transposed in the "Fauna" key (presuming that the correct lengths are those given in the descriptions), in which case the present species is smaller than *palliditarsis*. From *fuscipennis* the dark hind femora at once separates it.

SYNECHES MACULITHORAX sp. nov.

Male.—*Female*.—Head : Eyes absolutely contiguous in both sexes above, face narrow, dark yellow. Proboscis longer than the height of the head, brownish-grey. Palpi brown, extremely short and narrow, with a long apical bristle extending to two-thirds the length of the proboscis. Antennae orange-yellow, the sub-apical style black and twice the length of the joints.

Thorax : Viewed from above blackish, with brown patches on the median area subdorsally, the position varying with the light incidence. It usually appears as if there are black median and lateral stripes on a brown ground. Some strong bristles on the posterior slope and on the dark brown scutellum marginally. The mesonotal pattern is best seen from in front or from the side and above.

Abdomen: Dark brownish-black, rather well haired, especially towards base in male, the hairs rather paler. Genitalia in male small, concolorous; in female elongate, concolorous.

Legs: Coxae, femora and hind tibiae clear brown, anterior tibiae and all first four tarsal joints brownish-yellow, last tarsal joints black, incrassate. Hind tarsus with some golden pubescence, and slightly darker than the anterior pairs. Hind femora with about six long bristles below in anterior row, posterior row of very short spines intermingled with equally short hairs. Posterior femora and all tibiae with hairs as well as regular bristles.

Wings: Brown, stigma elongate, much darker. First posterior cell slightly broader at middle of last section of IV than before and beyond this point, but not at all narrowed. Second basal and anal cells sub-equal. Basal section of IV very weak. Halteres yellow-brown.

Long: $3\frac{1}{2}$ –4 mm.

Described from nine specimens of both sexes, taken on roadside, Habarane, North-Central Province, Ceylon. November 14 to 15, 1918. In my own collection. The species was common on low herbage in company with a small Asilid of the genus *Atomosia*.

In connection with the foregoing described species, Brunetti's table on pages 326 and 327 of the "Fauna" volume may be re-cast as follows:—

- | | | | |
|---|----|----|------------------------------|
| 10.—Wings distinctly brownish | .. | .. | 11 |
| Wings clear | .. | .. | <i>peradenique</i> nov. |
| 11.—Long: 5 mm., first posterior cell | | | |
| distinctly narrowed apically. | | | |
| Fifth sternite with golden hairs | | | |
| in ♀ | .. | .. | <i>palliditarsis</i> , Brun. |
| Long $3\frac{1}{2}$ mm., first posterior cell | | | |
| not narrowed. Fifth sternite | | | |
| without golden hairs in ♀ | .. | .. | 12 |
| 12.—Third antennal joint brown. | | | |
| Femora black | .. | .. | <i>fuscipennis</i> Brun. |
| Third antennal joint orange. | | | |
| Femora brown | .. | .. | <i>maculithorax</i> nov. |

TACHYDROMIA MONTICOLA sp. nov.

Female.—Head : Black, occiput with some greyish shimmer. Clypeal margin yellow, proboscis black. Antennae black, style, except extreme base, yellowish-white. Proboscis three-quarters the height of the head in length

Thorax : Shining black with dull yellow pollen. Scutellum similar. A pre-alar bristle.

Abdomen : Shining black, no pollen.

Legs : Very dark brownish-black, fore trochanters and extreme tip of coxae yellowish.

Wings : Grey, anal vein very weak interior to junction of lower branch of V. Anterior cross vein joining upper end of posterior (being thus at extreme tip of discal cell), the posterior cross vein oblique. First posterior cell narrowed apically, but the branches ultimately parallel. Halteres dull greyish.

Long : $2\frac{1}{2}$ mm.

Described from a female in good condition, taken on flowering trees at edge of forest, Pattipola, Ceylon, 6,200 feet, May 5, 1923. In my own collection.

A second specimen, also a female, same place and date, has the fore coxae all pale and the mid femora reddish-brown. In this specimen the palpi are visible and are short, pale, flattened. Whether this specimen represents another species, or, more likely, a paler, possibly immature form, the material is too scanty to decide.

The present species differs from *gentilis*, Brun. by the black legs, and from *orientalis* Brun. by the all black antennae.

Phoridae.**APHIOCHAETA PSEUDOSCALARIS** sp. nov.

Female.—Frons yellow, with very fine black pubescence. Ocellar triangle not obvious, the upper ocelli dividing the vertex into three equal parts. All cephalic bristles black.

The two upper frontal rows of four each, reclinate, the inner pair of second row slightly but distinctly *lower* than the outer pair. A post-vertical pair of convergent small bristles contiguous to the outer pair of upper frontals. Third row of frontals with the outer bristle as much below the second row as this is below the first, below which there is what is probably the inner bristle of the third row, situate slightly more medially than the outer bristle, and both reclinate. Fourth row proclinate, the outer bristle twice as distant inwardly from the lower bristle of the third row as this is from eye margin, and half as far below it as the latter is below its outer bristle. The inner pair of the fourth row are still lower and close together on mid line. The third and fourth rows form a semi-circle. Face orange-yellow. A post-ocular row of small bristles, *four* strong bristles at lower edge of eye, and a much weaker row on lower edge of face. Eyes minutely pale pubescent. Antennae pale yellowish, arista *bare*, the basal joint yellow, the apical black. Palpi pale yellowish, with several strong bristles.

Thorax: Yellow, dorsum with closely set black setulae, unmarked. Scutellum paler yellow, with only two strong bristles, closely exterior to which are a pair of minute bristles, hardly stronger than the thoracic setulae. Pleurae bare.

Abdomen: Dull yellow, probably variable in appearance. in the type the sides of the dorsal surface of the first, third, and fourth segments are blackened, and there is a lateral spot on the fifth segment. Venter brighter yellow.

Legs: Pale, with dark setulae. Tips of hind femora and tibiae blackened. Hind tibiae strongly bristled on inner side.

Wings: With veins paler and less distinct than in *scalaris*, the third vein ending slightly beyond the middle of the wing, and with the fork more widely open than in the latter species. Halteres yellow, the stem slightly darkened.

Long: $2\frac{1}{4}$ mm.

Described from a unique female in good condition, taken at Banhar, North Bihar, October 8, 1921, by Mr. H. A. Inglis. Type in my own collection.

The chief points of difference from *scalaris* are the two-bristled scutellum and the four strong infra-ocular bristles, but when the two species are placed side by side they appear amply distinct in facies.

APHIOCHAETA ACHATINAE sp. nov.

Female.—Head: Frons and face greyish-yellow with minute scattered black hairs.

Ocellar triangle and frontal groove distinct. Bristles black, verticals and ocellars strong, erect, divergent; at one-third of frons a row of four reclinate frontals all on one level, below, a curved row of six, of which the outer pair is at half the length of the frons, the middle and inmost pairs at two-thirds, the two outer reclinate, the latter alone proclinate. Antennae pale orange, flagellum, except base, black, microscopically pubescent. Palpi whitish with black bristles. At lower corner of eye three strong bristles, two anteriorly and one posteriorly downward directed.

Thorax: Yellow-brown with short black pubescence, unmarked, scutellum concolorous, with a strong apical and weak sub-apical pair of bristles. Pleurae concolorous, without pubescence.

Abdomen: Orange, unmarked. Second segment with short lateral bristles, and sixth with some irregularly placed ones on dorsum. Seventh segment narrow, whitish, the stout, bristly ovipositor black.

Legs: Whitish, mid coxae with a diamond-shaped black streak on posterior side.

Wings: Distinctly yellowish, exterior veins curved, the second and third markedly bisinuate. Halteres pale yellowish orange.

Long: 2 mm.

Described from a unique female in good condition taken on dead *Achatina* snail, Sudu-ganga, Matale, Ceylon, July 13, 1922. In my own collection.

The two above described species both run out with *latifasciata* in Brunetti's table of the Indian species. They will separate as follows:—

- | | |
|---|-------------------------------|
| 1.—Three rows of frontals distinct,
abdomen black marked later-
ally | 2 |
| Second and third rows of frontals
forming a single curved row,
abdomen unicolorous .. | <i>achatinae</i> , nov. |
| 2.—Third frontal row all reclinate, a
subsidiary proclinate fourth
row | <i>latifasciata</i> . Brun |
| Third row all proclinate | <i>pseudo-scalaris</i> , nov. |

PULICIPHORA TRISCLERITA sp. nov

(Text Fig. 4.)

Female.—Head: Dark brown. A post-ocular, two upper reclinate and a lower pair of proclinate frontals. Antennae yellow, pyriform, the long style very minutely pubescent, thickened basally. Palpi yellow with black bristles.

Thorax: Short, no longer than head, dark brown. A row of bristles on hind margin.

Abdomen: About five times as long as head and thorax together, enormous in comparison therewith, ovate. The first four tergites strongly chitinized, nearly black, those of the first two segments fused and twice as long as the third or fourth. Remainder of dorsum and venter pale yellow, membranous. The whole with pale pubescence.

Legs: Long, yellowish-brown. Front femora with a deep groove beneath throughout their length. Hind metatarsus incrassate, and with a black chitinized ridge on front margin which, displaced backwards laterally, runs over the next three joints, being apparently absent from the fifth.

Long: 1 mm.

Described from seven females out of a swarm bred in a decaying snail, *Achatina fulica*, at Sudu-ganga, Matale, Ceylon, on July 19, 1922. Type in my own collection.

The male is unknown.

The generic definition demands four chitinated abdominal tergites. In this species there appear to be only three, owing to the fusion of the first two.

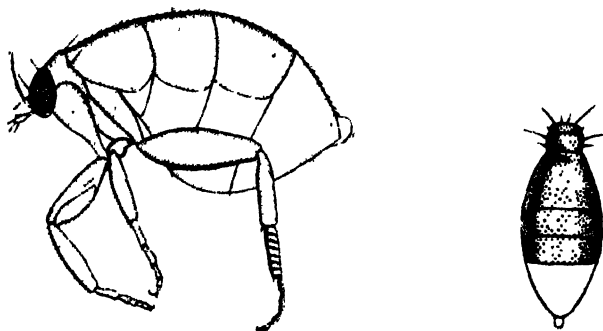


FIG. 4.—*Puliciphora tricolorata*.

Sepsidae.

SEPSIS INGLISI sp. nov.

(Text Fig. 5.)

Male.—*Female*. Head: Black, antennae brownish-yellow. The additional frontal bristle very minute, but present.

Thorax: Black, with an aeneous tinge. Sternopleuron white-dusted above only.

Abdomen: Black, with a purple tinge. The large male genitalia have the tip of the superior claspers furcate.

Legs: Fore pair yellow, except the last four tarsal joints, femora with two black ligulate spines on inner face below, the anterior much the broader, tibiae with a notch on inner edge before half length. Posterior legs black, the coxae and base of femora yellow, without conspicuous bristles. Front legs simple in female.

Wings: Clear. Halteres with dark stem and white capitellum.

Long: $3\frac{1}{2}$ mm.

Described from twelve males and five females, all taken by Mr. H. A. Inglis, after whom I have much pleasure in naming it, at Banhar, North Bihar, in July and August of 1921 and 1922. Type, allotype, and co-types in my own collection, co-type of each sex in Inglis's collection.

Very similar in appearance to *S. fasciculata* Brün., but separable in both sexes by the much weaker additional frontal bristle, and in the male by the very different genitalia and the different construction of the fore legs.

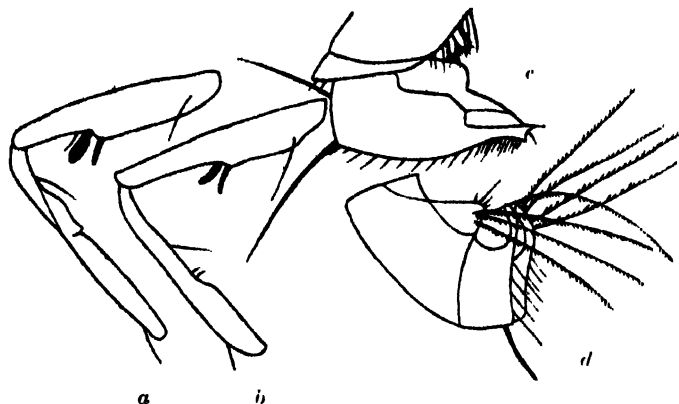


FIG. 5. a, c, *Sepsis trilinea* sp. nov. b, d. *Sepsis fasciculata* Brün.

Sapromyzidae.

LONCHAEA BICOLORICORNIS sp. nov.

Male.—*Female*.—Head: Frons black, in female one-third the width of head, rather less than this in the male. Parafrontalia at vertex one-third of this width each, running more or less parallel to the orbits to slightly below the lower corner of the ocellar triangle, from whence the margins are sharply angled outwards to touch the orbits at three-quarters the distance from the vertex. Parafrontalia shining, frontalia dull black, with a distinct separating ridge between, the whole with longish, scattered pubescence. Verticals 1: 2, the inner small, the two outer pairs long; ocellar pair long, porrect; orbitals 1, large, erect, situate slightly below the lower corner of the ocellar triangle. All bristles black. Face dull black. parafacialia and genae dull grey shimmering. A distinct median paler grey facial stripe; epistomal margin above outlined ochreous, pre-labrum somewhat prominent, black. Antennae longer than the face, very broad from back to front, dark brownish, the extreme base and hinder edge except at tip yellow, as are the small basal joints, the second of which

bears a thin black bristle. Arista bare, the basal third yellowish, remainder black. Palpi phylliform, yellow. Proboscis black.

Thorax: Shining black, in some lights with a steel-blue tinge. Chaetotaxy: a humeral, 2 notopleural, 3 supra-alar, 1 acrostichal and 2 dorso-central, 4 scutellar, the apicals parallel, 5 marginals on mesopleuron posteriorly, one sternopleural. The whole thorax with fairly long pubescence except on scutellum, where it is confined to the margins, sparsely. All bristles and pubescence black.

Abdomen: Black with steel-blue reflections. Male hypopygium inconspicuous; ovipositor small, yellowish.

Legs: Femora and tibiae black with steel-blue reflections, tarsi with first three joints yellow, the two apical black.

Wings: Hyaline, foreborder yellowish, especially towards base. Veins yellow, the fourth slightly upturned in the margin. Halteres black.

Long: 5 mm.

Described from a male and two females, none in perfect condition, bred from *Excaccharia agallocha*, Sunderbans, Bengal (C. Beeson), between January 24 and March 14, 1921. Type male and female in Forest Entomologist's collection, Dehra Dun, co-type female in my own collection.

Separates from *L. megicera*, Kert., on the yellow second and third tarsal joints.

Muscidae.

GRAPHOMYIA LUTEICORNIS sp. nov.

Female.—Head: Frons one-quarter head width; frontal stripe black, somewhat narrowed anteriorly, parafrontalia dull silvery, narrow. Face silvery, with a strong median carina, yellowish shining, produced into a knob at level of first third of third antennal joint. Antennae pale dull yellow, not quite reaching to level of lower corner of eye, arista concolorous, with long black rays. Palpi rather brighter yellow, apically sub-clavate, proboscis very dark brown to yellowish. Eyes bare.

Thorax: Pale ashy-grey, with two pairs of narrow blackish stripes, the interior commencing halfway between suture and

root of scutellum, and running straight and uninterruptedly to front margin, very slightly converging; the outer commencing posterior to the inner, but stopping before the suture in front of which they are only represented by a pair of elongate, triangular spots. Presuturally both pairs of stripes may be yellowish-brown.

Pleurae yellow, thickly grey dusted. Scutellum brownish-yellow.

Chaetotaxy: Acrostichals only a weak prescutellar pair Dorso-centrals 2: 4. Humerals 3. Post-humerals 2. Notopleurals 2. Supra-alars 1: 2: 2, a weak intermediate between anterior and median sets. Mesopleurals 1 anterior and a row of about 6 along posterior margin. Sternopleurals 1: 2. No pteropleural. Scutellum, a basal and apical pair of strong marginals, the latter crossed. Two pairs of weak discals behind the apicals.

Abdomen: (Viewed from in front.) Apparent first segment yellowish-brown. Second and third yellowish-grey, with ill-defined lateral brownish spots, and a similar median area ill-defined in outline. Fourth segment with similar ground colour, but the two spots it bears rusty-yellow. The anterior half of the second segment may be concolorous with the first, as also the apical half of fourth. On second and third the median dark areas may be resolved into a pair of small admedian black spots on the anterior margins of the segments.

Legs: Yellowish-brown. Tarsi black.

Wings: Costal bristle none or very weak. Vein I ending just beyond anterior cross vein, which itself is just beyond the middle of the discal cell, IV changing direction at its insertion, its last section evenly curved, leaving first posterior as wide open as is the sub-costal cell. A few weak bristles on node of III above and below. Halteres yellowish.

Long: 6-6½ mm.

Described from two females in good condition, both taken at flowers of *Mikania scandens* at dusk, Sudu-ganga, Matale, Ceylon, on February 4, 1920 (type and co-type) in my own collection. A male, from the same place, taken on window, January 17, 1920, was sent to Dr. J. Villeneuve and is in his collection.

PROCEEDINGS OF THE CEYLON NATURAL HISTORY SOCIETY.

Forty-second General Meeting.

THE Forty-second General Meeting was held in the Colombo Museum Reading Room on Wednesday, October 25, 1922, at 5.45 P.M., Dr. A. Nell in the Chair.

A paper entitled "Fleas in relation to Plague" was read by Dr. L. F. Hirst.

Mr. C. T. Symons exhibited a fine collection of photographic enlargements illustrating animal life in the jungle.

Eleventh Annual General Meeting.

The Eleventh Annual General Meeting was held in the Colombo Museum Reading Room on Tuesday, February 20, 1923, at 5.30 P.M., Dr. A. Nell in the Chair.

The accounts and report of the Honorary Secretary and Treasurer for 1922 were read and confirmed.

The following Office-bearers were elected for the ensuing year :—

Patron : His Excellency the Governor.

President : The Hon. Mr. Cecil Clementi, C.M.G.

Vice-Presidents.—Very Rev. Father LeGoc. Mr. W. E. Wait
Dr. A. Nell, and Dr. Joseph Pearson.

Council : The Ven. F. H. de Winton, Dr. L. Nicholls,
Hon. Mr. B. Horsburgh, and Messrs. W. W. A. Phillips, E. C. T.
Holsinger, and C. T. Symons.

Honorary Secretary and Treasurer.—Mr. A. H. Malpas.

New Members.—Messrs. C. H. de Saram, S. R. de Silva
H. G. Cornish, E. G. Nichols, and W. Richard de Silva.

A paper entitled "Ceylon Bats" was read by Mr. W. W. A Phillips.

Forty-fourth General Meeting.

The Forty-fourth General Meeting was held in the Colombo Museum Reading Room on Wednesday, July 11, 1923, at 5.30 P.M.
Hon. Mr. C. Clementi in the Chair.

New Members.—Dr. H. U. Leembruggen, Mr. C. W. Sinclair,
and Hon. Mr. E. B. Alexander.

Mr. W. E. Wait read a paper on "Oceanic Bird Wanderers to Ceylon."

Mr. George Brown read a paper on "Notes on Migrations, with reference to the Hill Zone of Ceylon."

Forty-fifth General Meeting.

The Forty-fifth General Meeting was held in the Colombo Museum Reading Room on Tuesday, October 2, 1923, at 5.30 P.M.

Dr. A. Nell in the Chair.

New Members.—Messrs. M. J. Cary, F. H. Layard, A. J. Hanscombe, F. O. Mackwood, Leslie Dow, Arthur S. Eaton, and Miss N. C. Carter.

A paper on "Snakes of Ceylon" was read by Mr. W. W. A. Phillips.

Forty-sixth General Meeting.

The Forty-sixth General Meeting was held in the Colombo Museum Reading Room on Tuesday, November 6, 1923, at 5.30 P.M.

Dr. A. Nell in the Chair.

New Members.—Messrs. S. D. J. Edward, F. L. C. Silva, C. H. Holmes, C. van Langenberg, J. T. C. Thambimuttu, W. J. E. Fernando, C. S. Senaveratne, J. A. Wijeyesinghe, S. Coomaraswamy, V. Ganeser, E. I. F. Fernando, S. M. Olegasegaram, D. Samson Senanayake, O. E. R. Abhayaratne, Chas. H. Pate, L. S. de Silva, Neil M. Fernando, L. J. H. Fernando, L. S. Williams, W. T. Chinniah, P. R. de Silva, H. L. H. de Mel, and E. A. Fonseka.

A paper on "Protozoology in relation to Medicine" was read by Dr. L. Nicholls.

Forty-seventh General Meeting.

The Forty-seventh General Meeting was held in the Colombo Museum Reading Room on Tuesday, December 4, 1923, at 5.30 P.M.

Dr. Joseph Pearson in the Chair.

New Member.—Mr. Eric C. K. Minor.

Mr. W. E. Wait read a paper on Dr. Willis's Book entitled "Age and Area" with relation to evolution and distribution of Species.

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